WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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A KITCHEN DRESSER.

BY DAVID DENNING.

THE homely dresser may not present many attractions to the artistically-minded amateur cabinet-maker, but it is nevertheless more truly a piece of "art" furniture than many of the more pretentious things which are classed as such. It is, however, not so much as an artistic production that we have to regard it at present, for, whatever claims it may have in this respect, they must give way to the more prosaic views of the utilitarian. Still, one feels loth to contemplate the dresser only as a useful piece of furniture; for, however plain and void of decorative detail it may be, and generally is, it so evidently fulfils the purpose for which it is intended that it can hardly be regarded as other than a structure which merits attention. We all know that one of the leading principles of art requires that nothing shall be made which is not adapted for use according to the expressed intention of its existence, and that due regard shall be paid to the manipulation of material, whatever this may be. Now, remembering that the dresser is for one of the inferior rooms, viz., the kitchen, we at once see that fanciful ornamentation would be out of place, and that it would be absurd to employ costly material in its construction. Thus far, therefore, the dresser may claim to be an honest contrivance, which is more than can be said of many things seen in our furniture shops.

Though some forms of dresser may be more convenient than others—or, let it be said, better adapted for the space and circumstances of the user—as the primary object is utility, details of arrangement may vary to a considerable extent. On the whole, however, we shall not go far wrong if we regard the dresser as the kitchen sideboard, and the pattern selected will probably embody the requirements of most people. In size we may take it as follows:—Length, 5 ft. 6 in.; width of top, 2 ft.; and height from floor, 2 ft. 9 in. As will be seen from the illustration, immediately under the top are three drawers. Below them are cupboards with an open space between. The set of plate shelves above the dresser is separate from it, and may be made or not. They form, in fact, no part of the dresser itself, but may be regarded as a very useful adjunct, and not out of place in any kitchen.

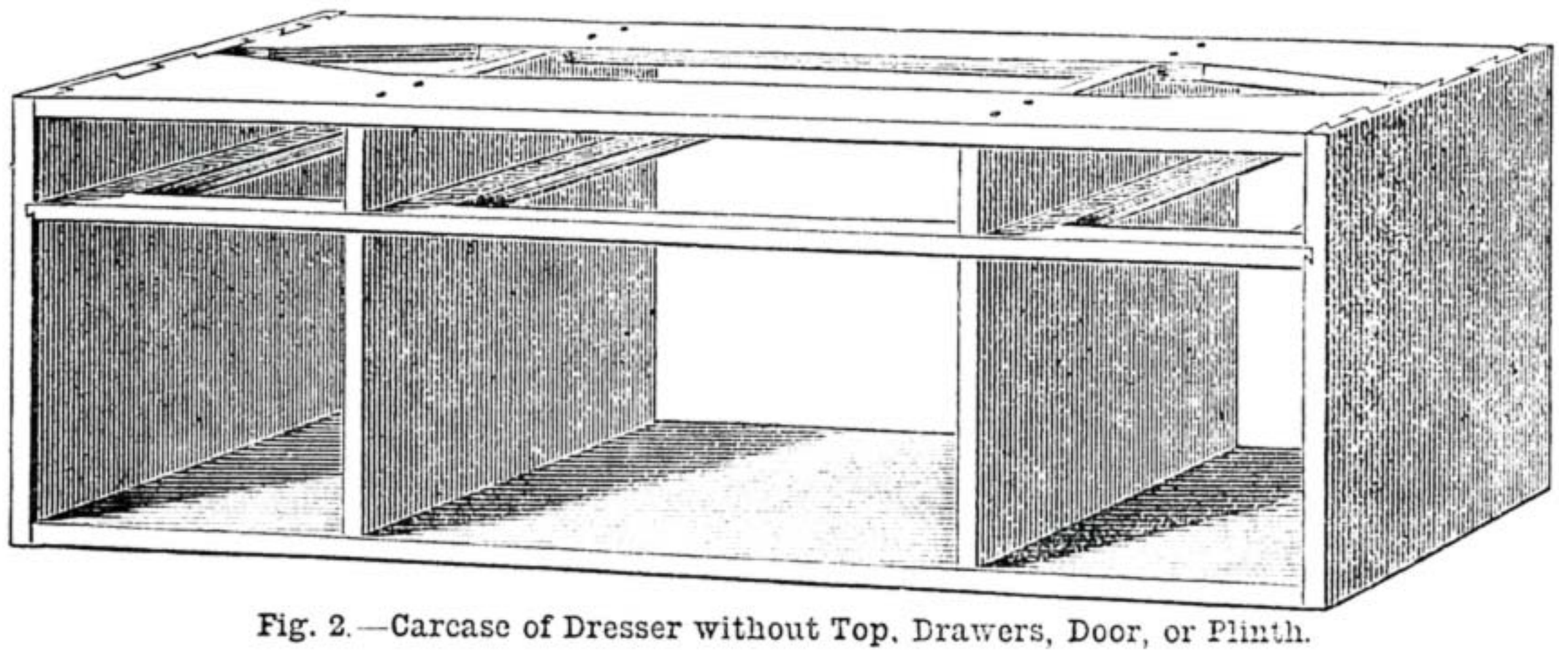

Fig. 2.—Carcase of Dresser without Top, Drawers, Door, or Plinth.

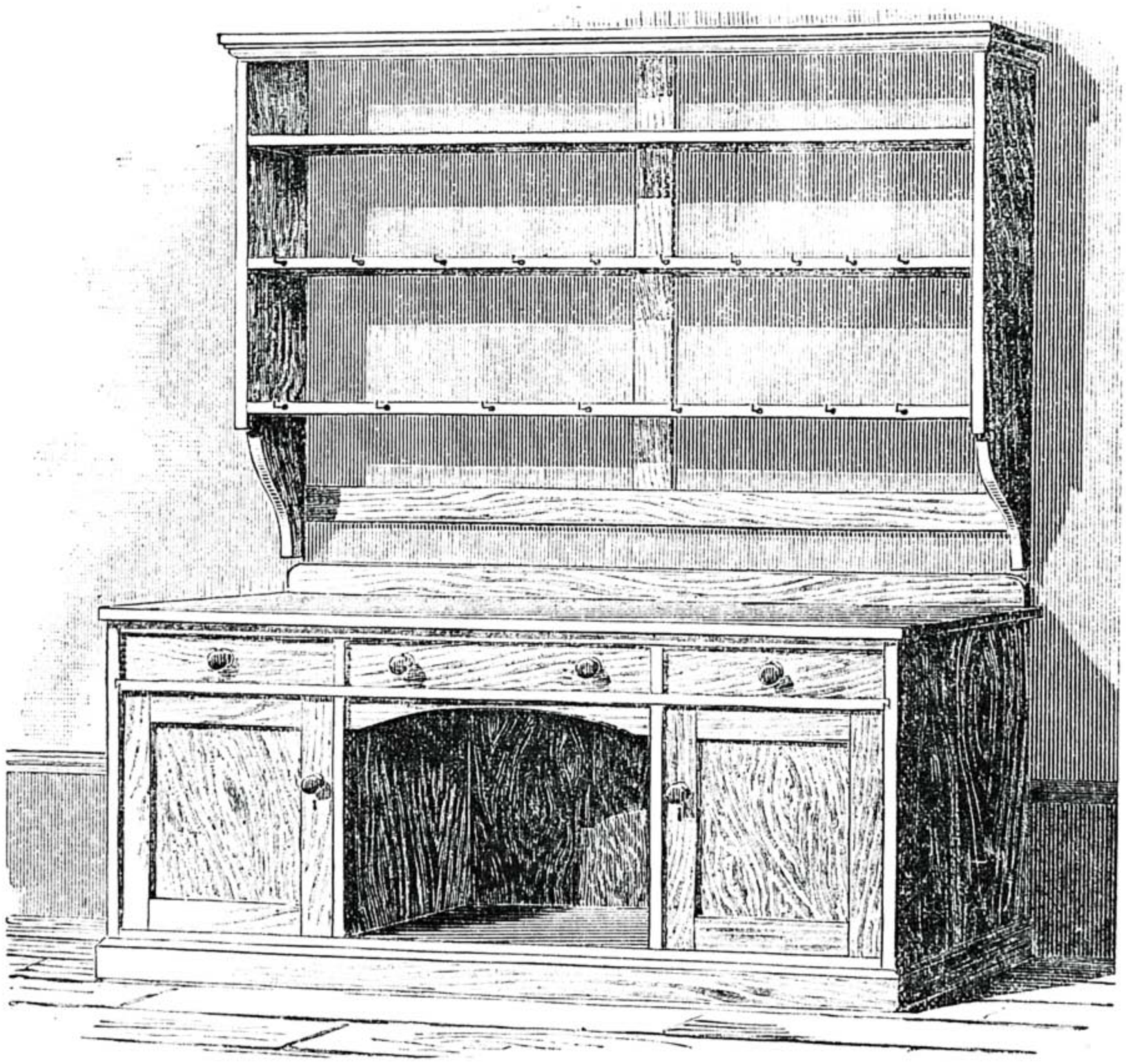

Fig. 1.—Kitchen Dresser and Plate Shelves.

Leaving them, however, for future consideration, a few suggestions to those readers who wish to make a dresser, and yet do not find the pattern portrayed quite what they want, may be welcomed before describing the actual construction.

First, the matter of size may claim attention, though to those who are practically acquainted with dresser-making this may seem unnecessary. The novice, however, is frequently at a loss what to do when any alteration from given figures may seem desirable, and therefore it may be well to say that he should make his sizes suit his—or his customer's—requirements. It is no use adhering closely to measurements simply because they have been "in print," or even because they are those commonly regarded as suitable, when others would clearly render the thing more convenient. Where certain measurements have become associated with furniture, custom is the principal factor, and custom is not as the laws of

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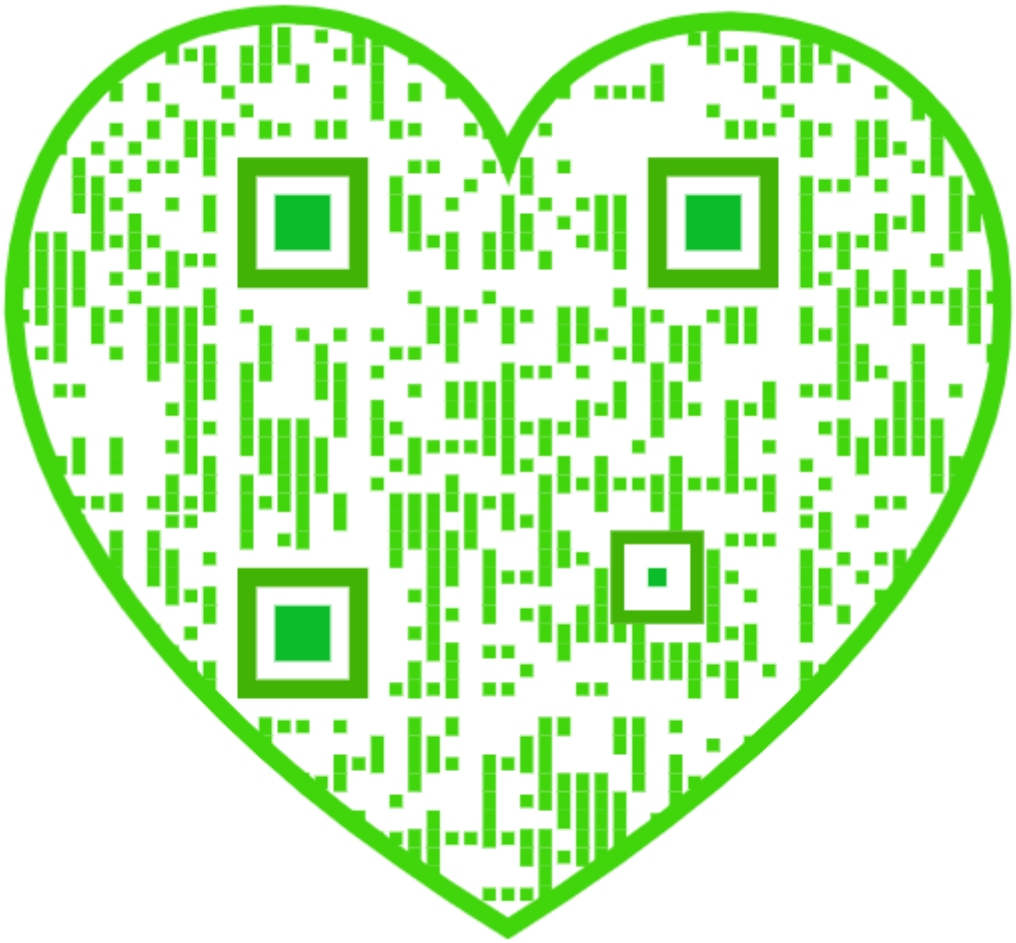

the Medes and Persians. When a dresser—or, for that matter, any other piece of furniture—is wanted, the maker should first consider what size will be most convenient for that particular article, and depart from the customary size if any advantage is to be gained by doing so. Now the novice who may prefer making his dresser 6 ft. 6 in. instead of 5 ft. 6 in., or in any other way departing from the sizes given, may be reassured that he will not be doing wrong by studying his own inclinations.

Possibly he may want to know also whether he must keep to any relative proportions between the various parts, such as width of cupboards, and opening between. If so, let me say, "No; again suit your own convenience." As a mere matter of appearance, it will be better to have the open space wider than the cupboards, but even this might be disputed by some.

Another maker may not want to have any open space, but would prefer three cupboards. Well, he can easily gratify his desire, for all he has to do is to fit a door to the opening, or, if the dresser is a large one, say 6 ft. 6 in. long, two doors. If he wants to know why two doors are recommended, it may be said that the only reason is because one would probably be inconveniently large.

But, supposing that only a small dresser is wanted, is there any reason for making three cupboards or doors? No; for two would do very well, and save time in making. Another individual would prefer more drawers, but from the illustration he does not quite see how he can manage to dispose them. Well, our design is sufficiently elastic to allow of adaptation even in this respect, for all that is necessary is to arrange as many drawers as may be required in the central space below the one shown.

Somebody else would like the drawers longer, or, at any rate, one or two of them. Of course, to make those in the centre longer is out of the question, but there is no reason why two long drawers should not take the place of the three comparatively short ones just below the top.

In any of the instances supposed, the principles of construction remain the same, and a little ingenuity and thought ought to enable the most inexperienced to make up almost any kind of enclosed dresser after he understands the following directions, which refer specifically to the dresser which I have shown in Fig. 1.

Before beginning to describe the construction, it should be said that the suggestions are given principally for the benefit of those who want to know how they *may* make a dresser. There is no *must* in the case; so that those who would find any other constructive details more in accordance with their own ideas, need not feel hampered by closely adhering to the methods named. They are, however, reliable, and may be implicitly followed.

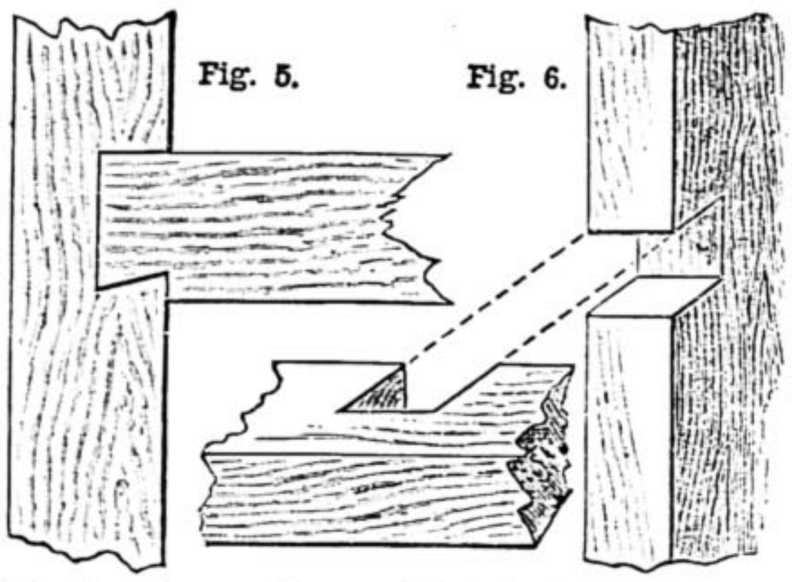

Fig. 5.—Drawer Bearer Joint to End. Fig. 6.—Halved Joint for Inner Ends and Bearer.

The material will naturally demand the first attention. It will suffice to say that good, sound, dry pine, clean and as free from knots as possible, is suitable in every way, and that any of the choicer kinds of furniture timber would be generally considered out of character. If made of mahogany, oak, or such like, our kitchen dresser would almost rank as a sideboard for the dining-room, though in this case better finish and more cunning joinery than is contemplated would be almost a necessity to support the assumption of the superior article. It merely remains to be said that 1 in. stuff is what will be principally required.

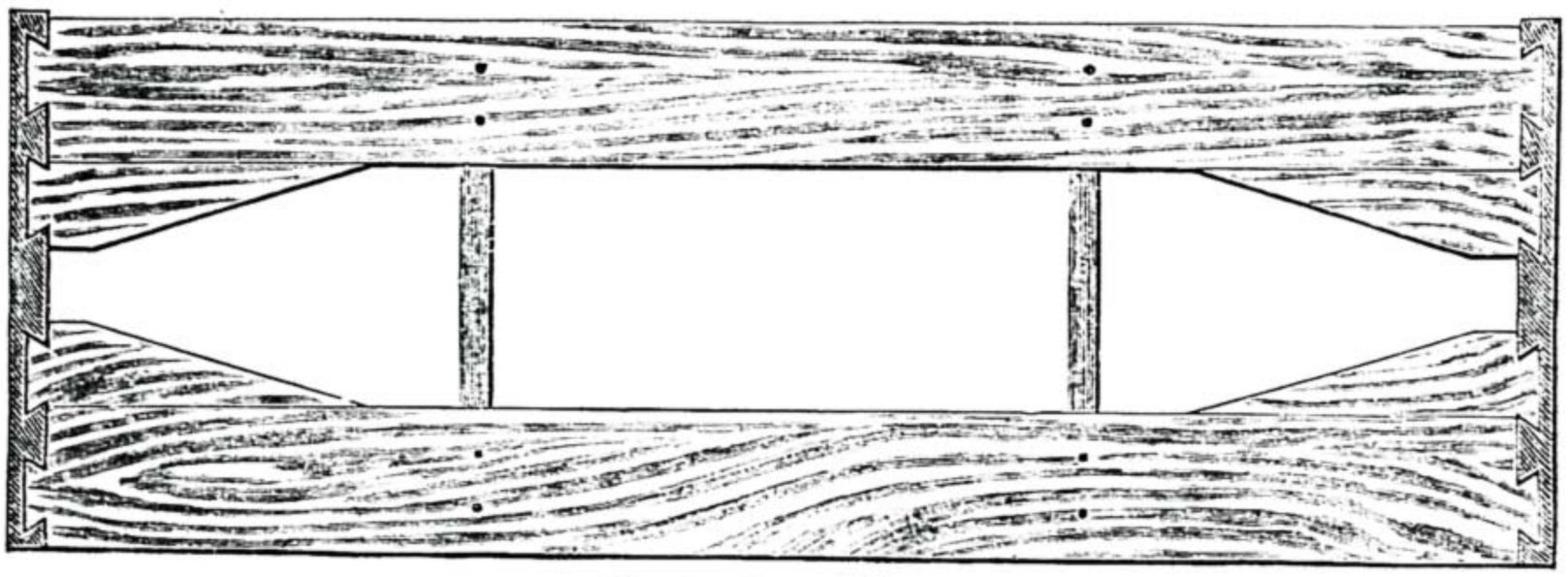

Fig. 4.—Plan of Top.

The top will have to be jointed up to get the necessary width, which should be at least an inch more than the ends of the cupboards, in order to allow of a slight overhang in front, and at the back if necessary. This may be explained by saying that if there is a skirting board, and the top of the dresser is to go close against the wall, the overhang at the back must not be less than the thickness of the skirting board. At the ends the top should overhang to the same extent as in front. This being understood, it matters little in what order the actual work be proceeded with; and, as the formation of the carcase is the principal part of the work, an outline of its construction must be given. It consists of a bottom, which, to all intents, is merely a repetition of the top, but smaller, as will be seen later on. To the bottom the four ends are fastened. On the upper edges of the ends the top may be nailed direct, but it will be better to connect the ends by stretchers or bearers of exactly the same length as the bottom board, and fasten the top to them. This involves more work, but is altogether the superior way. Other bearers—or, rather, one piece serving as bearer for three drawers—are also fronted, the whole, when put together, being as shown in Fig. 2.

We may now consider the mode of fitting and fastening all these parts together, merely premising that, wherever necessary, boards are fastened together to get the requisite width, and that the novice has read the articles on "Jointing Up" which have appeared in the first volume. Although plain glued joints will answer very well, it may be suggested that it will be good practice for the novice to use the dowelled joint. He will be able to "get his hand in," and have more confidence whenever he may have to make up anything in more costly wood than pine. Whatever joint he may use, I would caution him not to work up the parts till the glue is thoroughly set. The old adage of "more haste, less speed" is in nothing more apposite than in cabinet-work where glue is used.

Let us take the two outside ends first of all, and suppose the tyro wants to know all about them and their fastening to the bottom, or perhaps it will be better to say, how to accomplish this in a workmanlike manner. The thickness of the backing will have to be taken into account, for the width of the bottom will have to be that much less than the width of these end pieces. For purposes of explanation, let it be assumed that the back is to be ½ in. thick. The width of the bottom will, therefore, have to be ½ in. less than the ends. These are fitted to the bottom with lap dovetails, the construction of which will be sufficiently understood from Fig. 3. Extreme neatness in finishing these joints is not necessary, but care must be taken to have the front edges of the bottom and ends on the same level, leaving the excess of ½ in. to project at the back. A rabbet should be formed in them for the back to fit in, if a good job be intended; otherwise the boards of which the back is to be formed may just shoulder up against the ends.

The two inner ends of the cupboards must be exactly the same width at the bottom, to which they

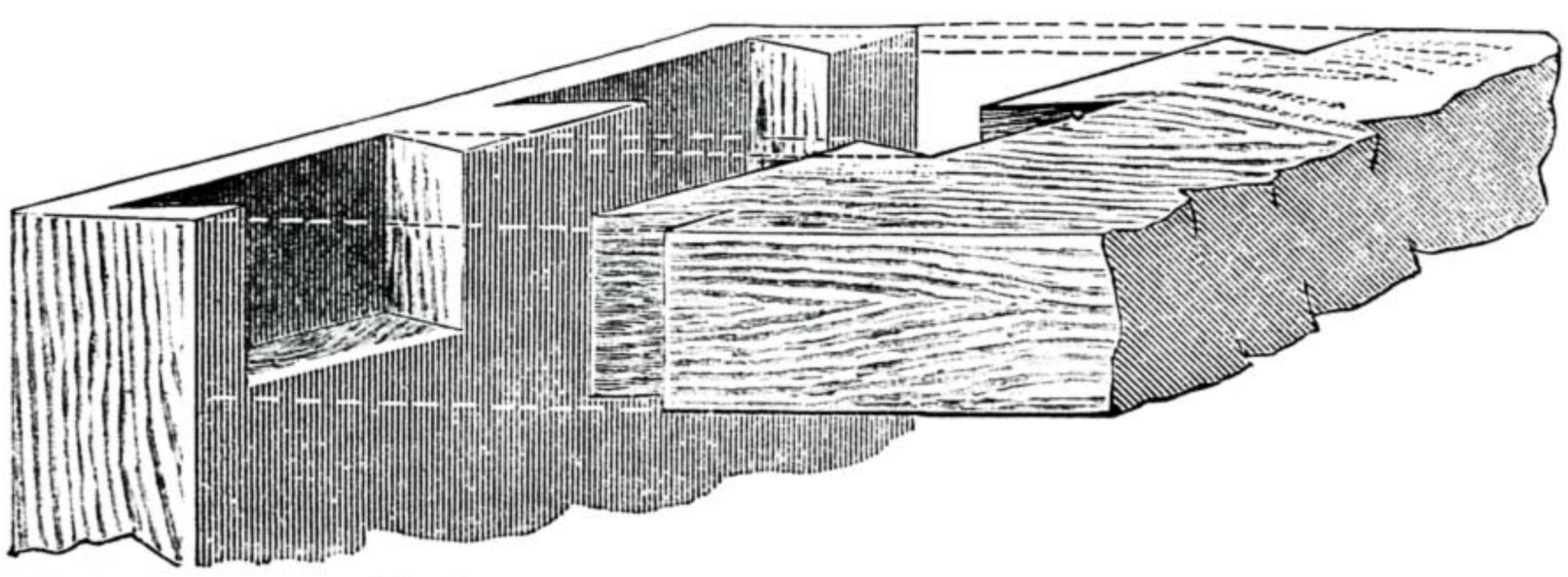

Fig. 3.—Diagram showing Principle of Lap Dovetail.

may either be fastened with mortise and tenon, or by nailing. In cutting these parts, regard must be had to the manner in which they are to be fastened at bottom, as, of course, the length of the tenons must be allowed for if these are to be cut. Much the same applies to fitting and fastening up the bearers for the top. These may be either a solid board exactly the same as the bottom, or the more usual course of making them of two pieces of wood of any convenient width—say, 5 in. By this means it will be seen that there is a saving in the quantity of wood, but the ends being only supported—or connected—by these two narrow pieces, they are not sufficiently bound together. This is managed by gluing pieces on to the ends of the bearers, which are thus widened out sufficiently without unnecessary waste of material. They are then fastened to the outside ends by the lap dovetail. The two inner ends may be treated as at the bottom. Fig. 4 gives a plan of the upper portion of the dresser at this stage, the widened bearers being clearly shown. It will be noted that the hinder one is set back to the same extent as the bottom board.

We have now the framework, so to speak, of the dresser, of which it will be understood that none of the parts are supposed to be permanently fastened together yet; in fact, in making it up, it will probably be convenient to arrange some of the work yet to be described before this stage. For instance, the necessary joints for the drawer bearers, etc., can be—at any rate, partially prepared. The novice, however, may be recommended not to adopt this course, but to fit up the parts so far spoken of, as by so doing he is more likely to secure accuracy. The parts should fit tightly enough to hold together squarely without any glue or nails, and unless they do, the work cannot be regarded as satisfactory. However, taking it for granted that everything is right, it will be an easy job to knock the pieces asunder to complete the work.

The drawer bearer—that is, the long piece immediately under the drawers in front—may now be attended to. Its width may be anything convenient, but about 3 in. is sufficient for all practical purposes; while its length can easily be ascertained exactly by actual measurement. It is fitted to the outer ends, as shown in Fig. 5, from which it will be seen that the dovetail formation of the lower side binds the parts together. The groove is cut in the ends for the whole width of the bearer, which is forced in from the front. At the inner ends the joint is merely formed by cutting spaces in the bearer and in the ends, as shown in Fig. 6. Care should be taken not to remove more stuff than is just sufficient to pass the pieces; in other words, they should fit each other tightly.

The supports for the drawer sides have now to be fitted, and for those who do not understand what they are, it may be explained that they are, as it were, bearers extending from back to front for the lower edges of the drawer sides to run on. It follows that their upper surfaces at any rate must be quite smooth, and on exactly the same level as the front bearer. Beyond repeating the caution that they must not be glued in such a way as to bind the ends, it will be unnecessary to give any minute directions for them, especially as these parts of construction were treated of at some length in the articles entitled "Lessons from an Old Bureau" in Vol. I. The novice who is in doubt will do well to read these, for they fully explain many details which it will be useful for him to know—including the construction of drawers. About the drawers it may be said here that the fronts should be fitted to the places for them, and marked, to prevent confusion afterwards. The sides should be treated in like manner, and not before every attention has been given to make these parts fit tightly should the actual making of the drawers be proceeded with. The sides and back of the drawers need not be more than $\frac{3}{8}$ in. thick, while the bottoms may be less if preferred. The reminder that drawers when first made should fit very tightly may be given, for if loose and easy, they will probably be too easy by-and-by. If they still remain too tight after a short time, a very slight easing-off will reduce them sufficiently.

The doors are made in the usual way. The parts for the frames are got out first, and may be either dowelled or mortised and tenoned together. Both rails and stiles should be of the same width, for which $2\frac{1}{2}$ in. will do very well. As some may not understand the meaning of "rails" and "stiles," I may explain that the former are the horizontal and the latter the upright portions of the frame. It will scarcely be necessary to state, except for the benefit of those quite unaccustomed to joinery, that the rails are to be placed within the stiles.

The panels for the doors should be $\frac{1}{2}$ in. stuff, either fitted into rabbets and beaded in from behind, or the frames may be grooved for them. In the latter case inexperienced workers may be inclined to think that glue should be used to fasten them in with; but they may be reminded that gluing them up would probably cause the panels to split. The grooves alone will hold the panels, which, being unglued at the edges, will be at liberty to shrink without splitting.

A couple of "butt" hinges will be required to hang each door with, and a lock or catch of some kind be requisite to keep them closed. The hinges should be attached to the outer ends of the cupboard, the bolts of the locks of course shooting into the others. One lock accordingly must be got shooting to the left, and the other to the right, unless it be not considered objectionable for one of the keyholes to be upside down.

Inside each cupboard one or more shelves will probably be found convenient. The shelves may be fixed in by simply nailing through the ends; but a better way—not only because no nailing from the outside will be necessary, but because the shelves will be movable—is to support them on strips of wood fastened to the insides of the cupboards. By this means, if at any time it is found convenient to add to or alter the shelves, it can easily be managed. The plinth or framing on which the dresser stands has still to be made and fitted, but no detailed directions for it can be necessary; and it would be merely waste of space to recapitulate what has been stated in connection with plinths in the articles already referred to on the bureau. Naturally, the dresser plinth will be plainer, having the upper edges left square, or slightly bevelled, instead of moulded; but otherwise its construction is much the same.

The top is fastened down to the carcase by screws driven through the top bearers or board from below; and when this has been done, our dresser is practically completed, so far as joinery is concerned, though it may be finished by painting or varnishing if desired. It will be understood that each drawer must have a knob or handle of some kind, the choice of which may be left for the reader's own decision, merely calling his attention to the fact that china knobs, fastening on with a screw, are generally used for the purpose.

Unless the top of the dresser fits against the wall, a small ledge at the back will be a convenience. A mere strip of wood, as shown in the illustration, will do as well as anything. It can either be fastened on behind or above the top with a few screws. Of course, if the plate shelves be made to rest on the dresser-top, and have a solid back, the back-guard will be superfluous; but this will be further considered when I come to treat of the shelves. Meanwhile, though no specific directions have been given for fitting the back to the dresser, the most inexperienced will see how to do this; so that these hints on dresser making may be regarded as complete.

BRICKLAYERS' WORK.

BY MUNIO.

APPLIANCES AND TOOLS USED BY BRICKLAYERS.

ONE of the principal appliances used by the bricklayer is the scaffolding, on which the materials are laid while building the walls. Great care should be used in fixing it, as upon its stability depend the lives of the men working upon it, and many serious accidents have occurred from insecure fixing, or from using defective materials.

The scaffolding is formed with uprights, ledgers or runners, putlogs, and scaffold boards; the uprights are generally foreign poles, 20 to 30 ft. long, and 7 in. in diameter; at the bottom end, they are fixed about 3 ft. 6 in. from the wall, and 12 to 14 ft. apart; the longest poles should be set at the gables, or at the highest part of the building to save splicing; they are fixed in holes dug about 3 ft. deep, and well rammed round to keep them perpendicular; when too short to reach the top of the building, a second pole is spliced to the top, the large end resting on a runner about 15 ft. below the top of the fixed pole; the top pole is lashed with ropes in three places, and wood wedges driven in to tighten them; diagonal stays are also lashed to the adjacent poles to steady them, and prevent their being blown down.

The runners are lashed to the poles with ropes in a horizontal direction; they are made of poles or deals 7 in. by $2\frac{1}{2}$ in.

The putlogs are laid with one end on the wall, and the other on the runners; they may be of any tough wood 6 ft. long, and $4\frac{1}{2}$ in. by 3 in.

The scaffold boards are 7 in. by 2 or $2\frac{1}{2}$ in., and are laid on the putlogs; when the scaffold is in a street, a board should be laid on its edge at the outside of the scaffold to prevent anything falling off the scaffold, and when the scaffold is very high, a board should be fixed along the outside about 3 ft. above the scaffold to form a handrail.

The materials are carried up ladders, which have a rope at each side hung over the runners, and two or three bricks tied to the end of the rope to keep the ladders from blowing down.

When any extra heavy weight has to come on a scaffold, such as a large stone or an iron girder, vertical struts should be fixed under the runners from the ground.

When a chimney stack has to be carried above the ridge, poles are fixed on the floor joists, and brought through the roof timbers and lashed to them.

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When a hole cannot be made for the foot of a pole, it may be fixed in a cask or box 3 ft. deep, and rammed round with sand; when the ground in which poles are to be set is very soft, a flat stone should be put under the foot to prevent its sinking when the scaffold is loaded.

Hoists.

When the walls of a building are very thick, and contain many bricks, a hoist is generally used for lifting the materials. After the first 15 to 20 ft. is built, a large pulley is fixed to a strong support, and a chain or rope put over it, to one end of which is attached a hook; the other end is carried round a pulley fixed on the ground called a "snatch block," a horse is attached to the end of the rope, and by walking outwards, the load is raised in a box attached to the hook. When there is not sufficient length for the horse to walk outwards, a "gin" is used, which consists of a vertical axle, to the upper part of which is fixed a drum 3 ft. or more in diameter; under this is fixed an arm 10 or 12 ft. long, to which the horse is attached, and by walking in a circle in opposite directions, the load is raised, or the empty box lowered. Steam-engines are also used for working hoists. Sometimes the bricks are run to the foot of the hoist in barrows, and the barrows with their loads lifted, three short chains with hooks being used to sling them, one hook being put under each handle and one in the wheel. In this case, a shaft is formed with boards to prevent the barrows turning round.

Trammels.

These are used for cutting the brickwork to in forming the lower half of an inverted arch; they are made to the form of the outside course in the arch, and fixed in the position the arch will occupy, and the wall is built to them; when the wall is thick, one is fixed at each side, and the wall levelled up between them.

Centres.

These are used for turning arches, and are made with ribs, on which are nailed laths or boards; they are made to the exact form of the soffits, or underside, of the arch; they are fixed on proper supports, and if of large size, wedges are fixed under them to slack the centre after the arch is keyed. In building an inverted arch, a board is fixed with a nail in the centre, a cord is attached to the nail, and the courses are made to radiate to the centre.

Templet or Profile.

When the top part of a wall is to be sloped or racked back, a templet or profile is set up, the height of each course marked upon it, and the line strung to these marks while building; if the wall is curved or battering on the face, such as a retaining or wing wall of a bridge, the templet is made to that form.

In turning a range of arches where the quoin or angle cannot be built first, a templet is used; sometimes a temporary pillar or plumbing of brickwork is built for this purpose, called a "deadman," and afterwards taken down.

Tools.

The following tools are used by the bricklayer:—The trowel (Fig. 1), with which the mortar is taken up and spread, and the joints struck; the brick hammer (Fig. 2), with which the bricks are cut; the jointer (Fig. 3), for drawing and marking the joints; the jointing rule is a straightedge, 8 ft. long and 4 in. wide; the plumb rule (Fig. 4), for plumbing the angles or quoins; the level (Fig. 5), for levelling the walls—sometimes a spirit level is used, laid on a straightedge 10 or 12 ft. long, with parallel edges; the camber slip (Fig. 6), for drawing the soffits of camber arches; the hod (Fig. 7), for carrying the bricks and mortar, also squares, bevils, and mortar boards, a gauging rod marked in feet and inches for setting out work, and a line to wall the bricks to. For cutting and gauged work, a bench or banker is required, with a rubbing stone 14 in. in diameter, fixed at one end for rubbing the bricks on; the bedding stone, a slab of marble or York stone, perfectly straight and level, on which the bricks are tried after being rubbed; chisels, scotch, scriber for marking the joints, and tin saw for nicking the beds and joints, after which they are cut by the chisels and scotch.

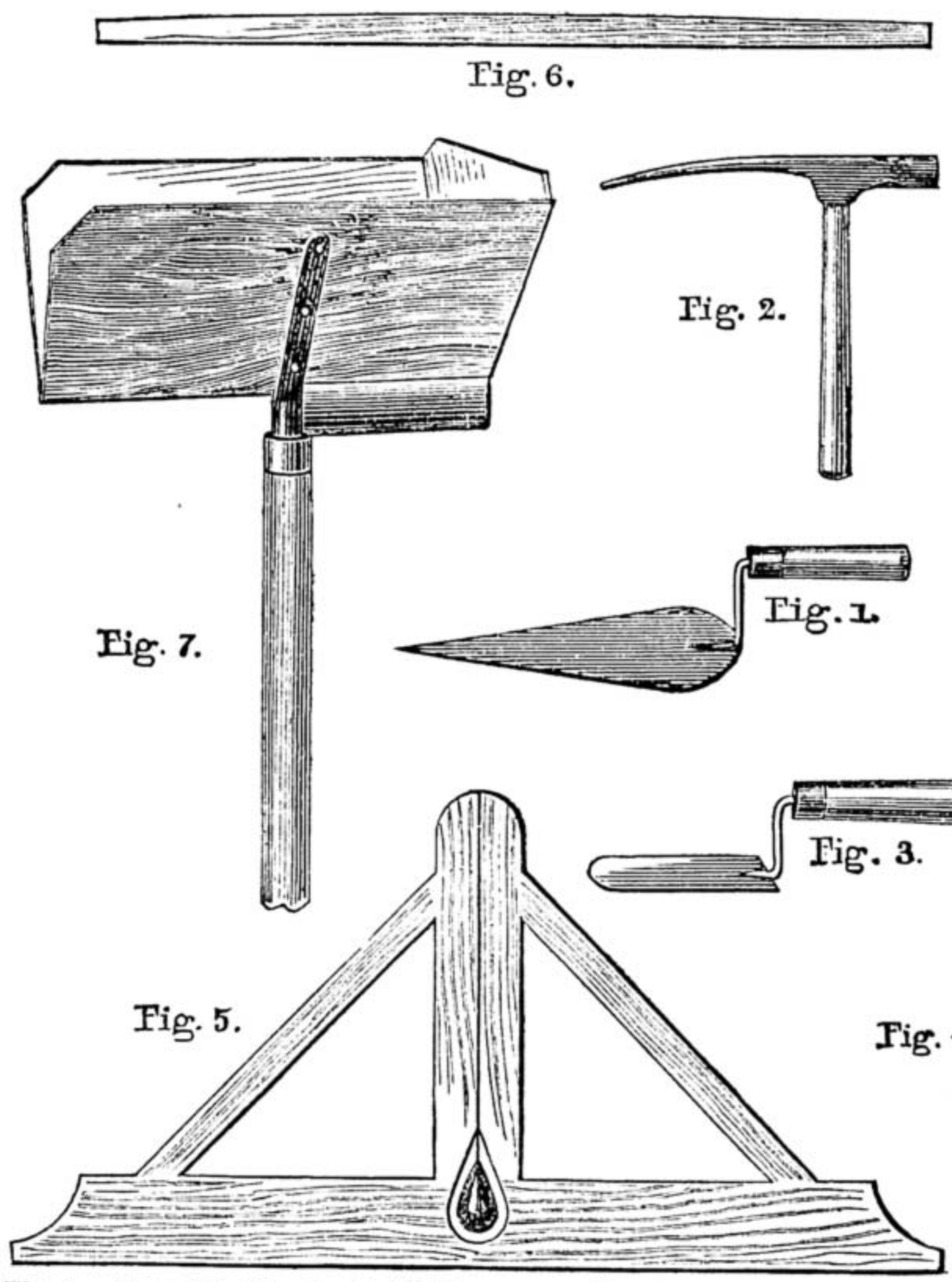

Fig. 1.—Trowel. Fig. 2.—Brick Hammer. Fig. 3.—Jointer. Fig. 4.—Plumb Rule. Fig. 5.—Level. Fig. 6.—Camber Slip. Fig. 7.—Hod.

Foundations.

In commencing to dig the foundations of a building, the outside walls should first be marked out, and pegs driven in at the angles; then dig off all the turf and vegetable soil, and wheel it into a heap if required for future use, or cart it away if not required. Then mark out the front wall of the building, and square the other walls from it; the cross walls should be gauged from a centre line or from one wall, and not from wall to wall, as if there should be any inaccuracy in one wall it is repeated through the rest. The trenches should be neatly squared out and levelled, and if any part of the site is on a slope, the trenches should be "stepped," keeping the bottom level, and making the rise of the steps equal to a certain number of courses of bricks. Where the foundation is of one uniform hardness, the footings of brick or stone may be laid in the trenches; but if some parts are hard, and others yielding, a bed of concrete should be laid in the trenches; and, even if the foundation is good, this method is to be recommended, as it makes a good uniform footing. When there are any wet places on the site, drains should be laid from them, and afterwards connected to the house drain. When the site is clay, it is advisable to cover the site under boarded floors with 6 in. of concrete, to prevent damp being drawn up by the warmth of the rooms when the house is finished. When laying concrete in the trenches, pegs should be driven in at the sides of the trenches, the tops of which are at the level of the concrete, and the concrete is levelled to them. The concrete should not be less than 1 ft. thick, but in soft ground it may be 2 or 3 ft. thick.

In digging cellars, tanks, etc., their position must be accurately marked out from the front line, and kept the full size of the outside of the walls to the bottom. A drain must be dug from the bottom of the cellar.

After the walls are built up to the surface, the whole of the foundations must be filled in at both sides and well rammed down.

HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

My Cowan Hive.

One of the greatest secrets of success in bee keeping is the careful and comfortable wintering of stocks. Consequently, any hive which secures this object ought to be a favourite with bee keepers.

Few are as good, and none surpass, the Cowan hive in this respect. It is the invention of Mr. T. W. Cowan, the editor of the *British Bee Journal*, and perhaps one of the best apiarists in the world.

I give three views of it, taken from his own book, "The British Bee Keeper's Guide Book;" a work which should be in the possession of everybody who hopes to be a successful bee master. Fig. 1 is a general view of the outside, from which it will be seen that it differs little in appearance from the "Apis" hive; in fact, I took some of the best features from it. In Figs. 2 and 3, it will be seen that the internal arrangements are very different. Instead of double sides, with a dead air space between, the brood-nest consists of two distinct boxes, without tops or bottoms, just laid upon the floor board. The inside box, A, is the brood-nest proper, in which are hung the frames; while the outer, F, serves only as a case, the space between being filled with chaff.

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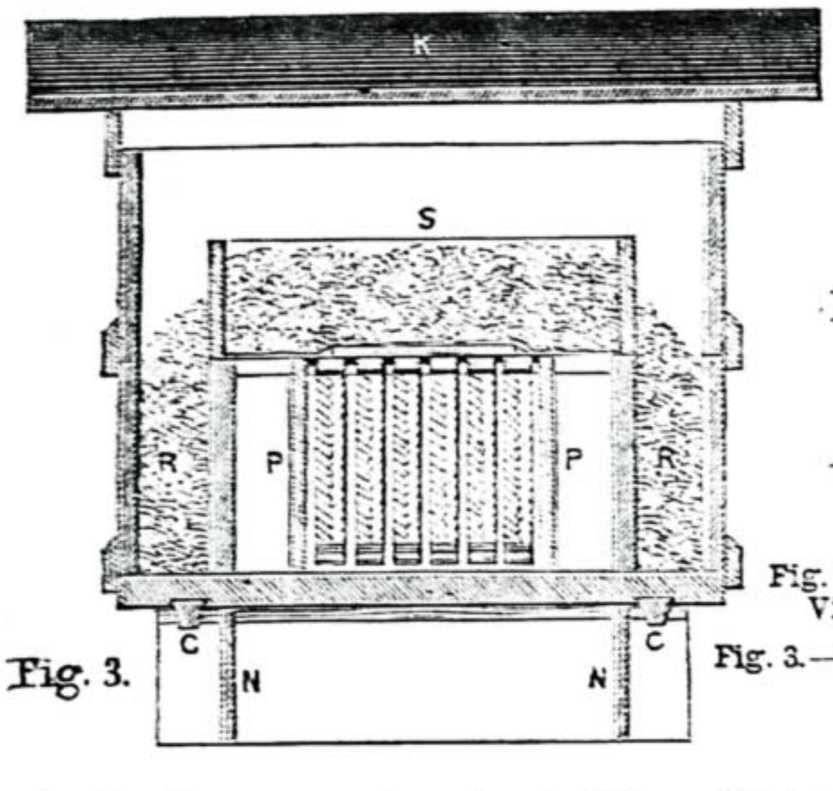

Fig. 3.

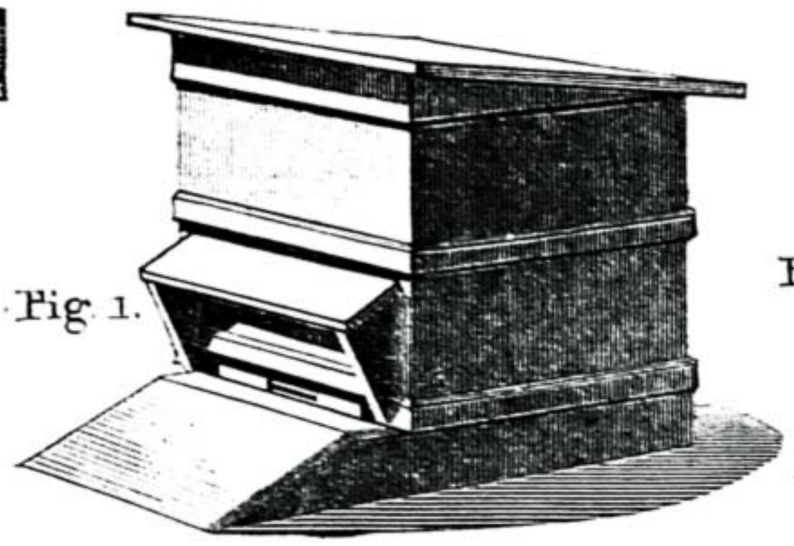

Fig. 1.

Fig. 1.—General External View of Cowan Hive.

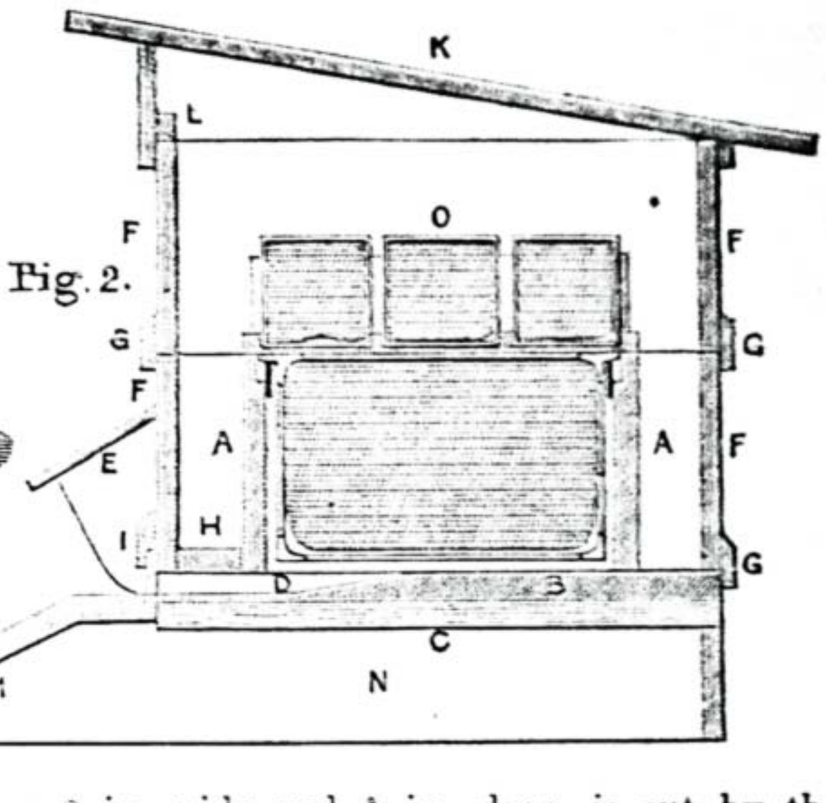

Fig. 2.

Fig. 2.—Sectional View from front to back.

Fig. 3.—View of Internal Arrangements as seen from behind.

As the doorway, D, is cut out of the solid floor board, a piece of wood, H, must be laid over it to prevent the chaff from stopping it up. It will be seen from Fig. 3 that in the winter this hive forms a very snug habitation for the bees, being surrounded by about 3 in. of cork dust or chaff, which is warm and yet porous enough to allow of free ventilation without draught.

I made my Cowan hive slightly different from that shown in Figs. 2 and 3, because I wished to utilise the ordinary frames which I use with the other hives. In principle, however, it is the same. I can strongly recommend this hive to my amateur friends, as being easy to make and very efficient. Its only drawback is that it is rather unwieldy and takes a good deal of wood.

The first thing to make is the floor board (Fig. 4). This may be of two widths of 11 in. pine, 1¼ in. thick. The edges should be shot and ploughed to take a tongue which fits half into each, or else the parts may be dowelled together or counternailed, all of which operations have been already described in WORK. This will produce a board 22 in. square, which should be gone over with the plane at both sides before the next operation comes on. This is to affix a couple of stays, denoted in Fig. 3 by C.

They are made of pine 22 in. long and 2 in. square. They are planed down so that one edge is 1 in. wide, and the space for their reception, ¼ in. deep, is carefully cut out of the bottom of the floor with tenon saw and chisel. The entrance space (Fig. 4), 8 in. wide and ⅜ in. deep, is cut by the same means.

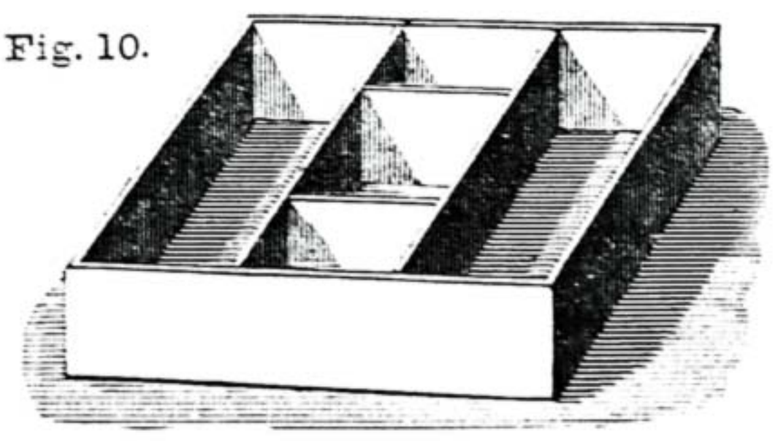

Fig. 10.

The top of the floor board should be perfectly flat, and to secure this, it should have been gone over with the trying plane in every direction before the entrance space was cut. The stays underneath will prevent it from warping, and yet allow of the free expansion and contraction of the wood.

Having the floor nicely finished, and the edges planed true and square, we next turn to the stand. Two pieces like Fig. 5 can be cut from a board 5 ft. long, 6 in. wide, and ¾ in. thick. They are kept 15 in. apart, just enough to fit inside the stays, C C (Fig. 3), by the alighting board, M, and the piece at the back seen in Fig. 2. The alighting board, which is 19 in. long, is nailed to them, as is also the horizontal piece 3 in. wide, seen in Fig. 5, which is nicely bevelled to fit the angle of the alighting board.

All this part of the work may be of deal ¾ in. thick, but the work should be carefully

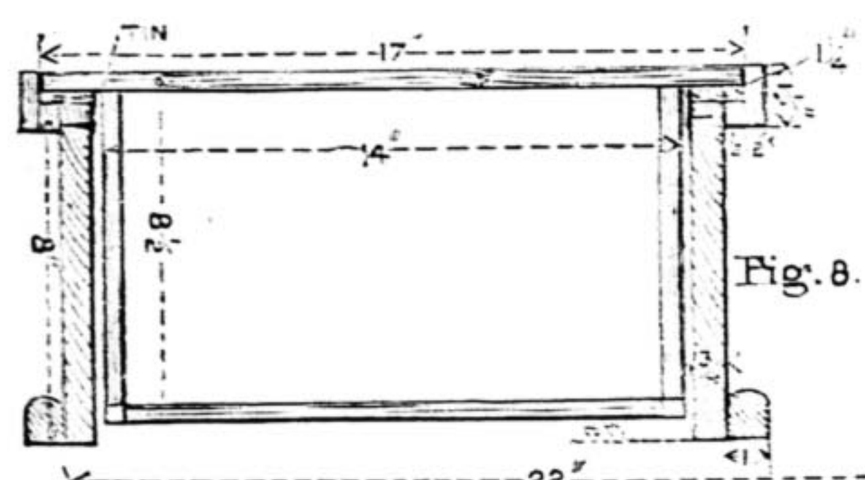

Fig. 8.

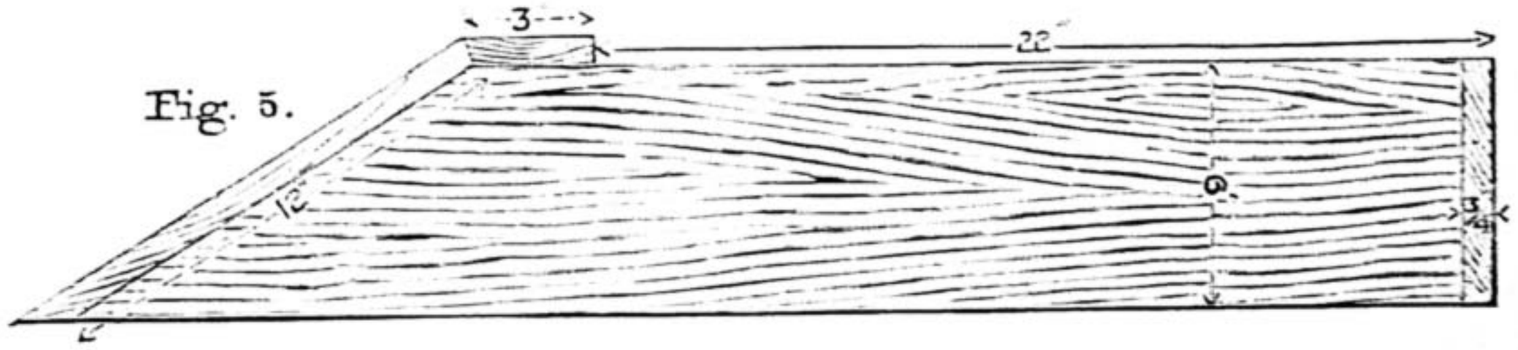

Fig. 5.

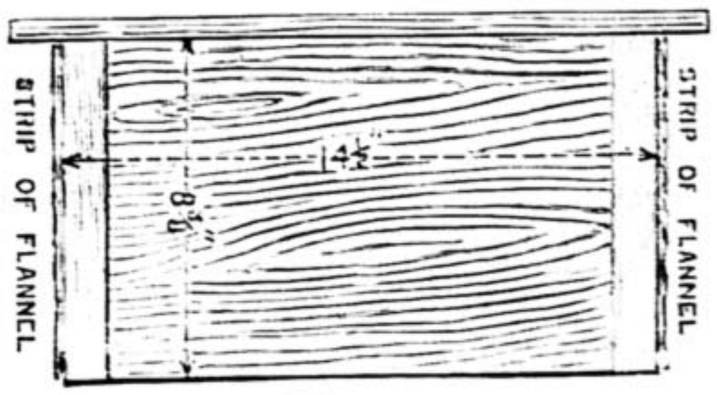

Fig. 11.

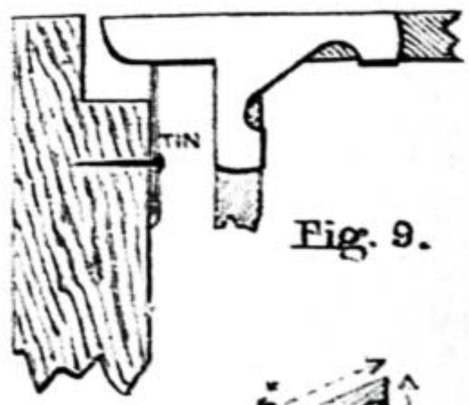

Fig. 9.

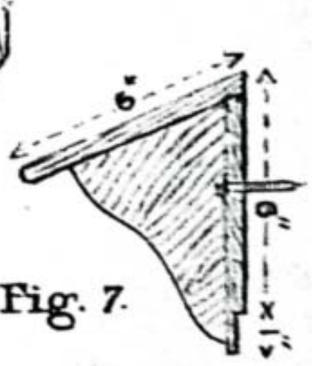

Fig. 7.

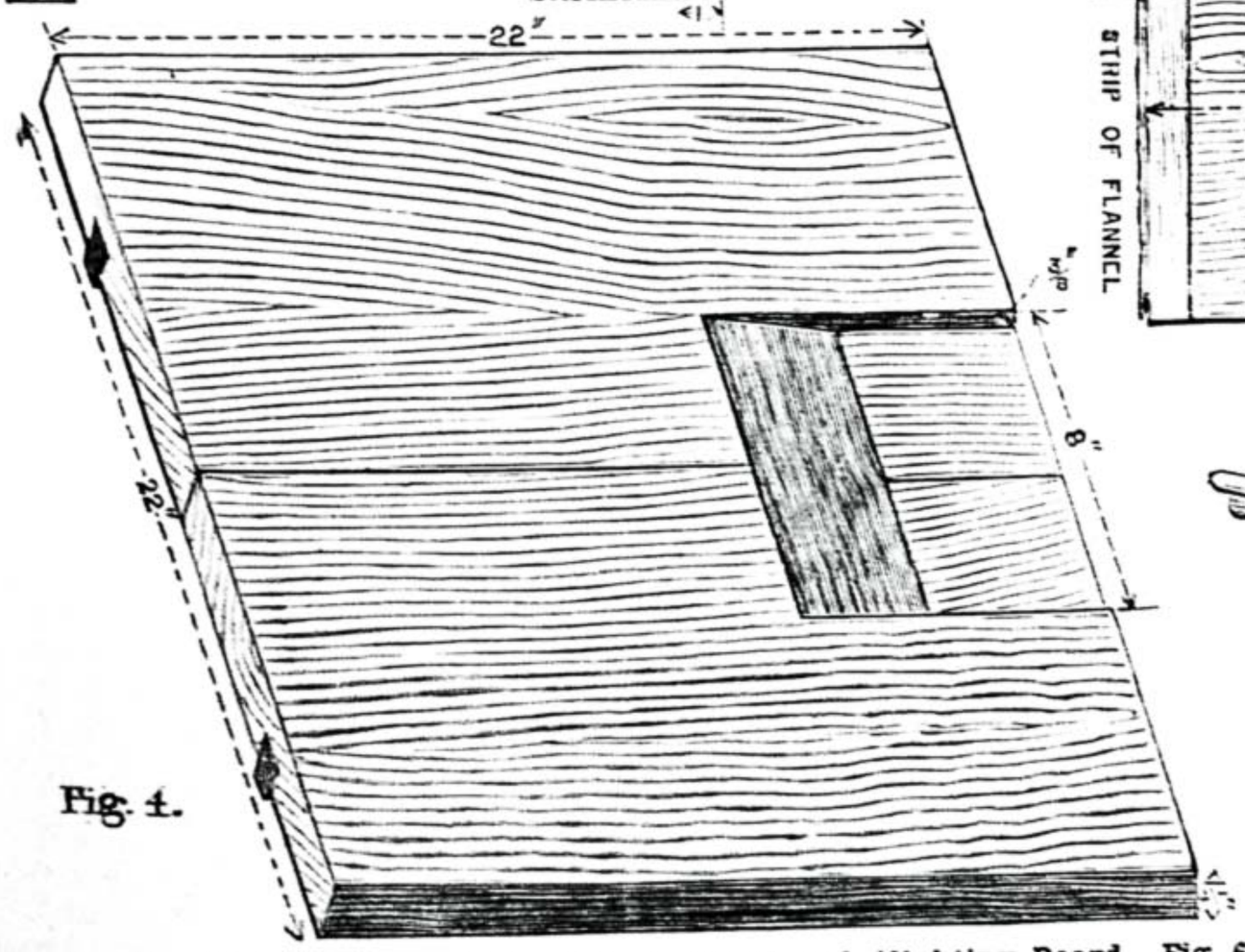

Fig. 4.

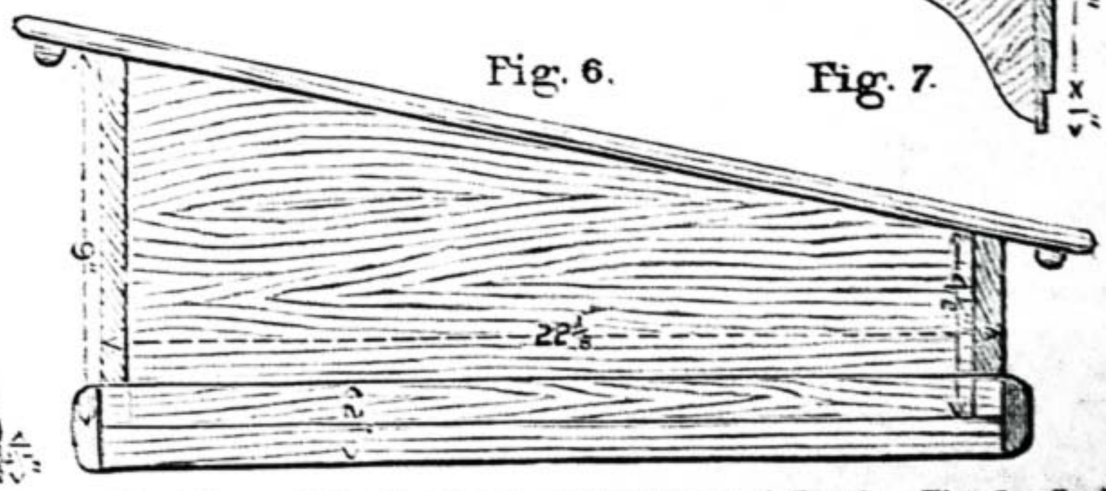

Fig. 6.

Fig. 4.—Floor Board. Fig. 5.—Side View of Stand and Alighting Board. Fig. 6.—Side View of Roof. Fig. 7.—Side View of Porch. Fig. 8.—Section showing Frame resting on Tin Slip. Fig. 9.—Section showing Novice's Metal Corner. Fig. 10.—View of Cushion with Feeding Hole. Fig. 11.—View of Division Board. (All figures to scale of 1 in. to 1 ft., except Fig. 9, which is half size, and Fig. 10, which is not to scale.)

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done, and finished nicely with a smoothing plane and sandpaper, if necessary.

A couple of outer cases may now be made of the same wood. It is better to dovetail them together at the corners, but if this is beyond the powers of the manufacturer, ordinary nailing and glue would do very well. They may be further strengthened with triangular pieces at the corners inside. The external length or breadth ought to be 22⅛ in., the ⅛ being to allow of ease in fitting over the bottom. For the same reason, I always take a few shavings off the top of each case, making it, as it were, cone shaped, so that the next storey will fit over it easily. The principal difficulty to be encountered in making these cases is to have them out of winding and square. Both can be successfully overcome by first nailing two sides together, and then the other two; then secure the loose corners by a nail in each, and lay the case flat on the floor board in the position which it is to occupy finally, and while thus laid and held down flat, the remaining nails can be driven home.

Even if it is slightly in winding, it can be planed true afterwards, as it does not require to be quite 9 in. high when finished.

As we are at the outer case, I had better go on to the roof, and here my hive differs from that shown in Figs. 1, 2, and 3. I wished to have sufficient room for three crates of sections, and accordingly made the roof 4½ in. deep at the shallowest part, sloping from that up to 9 in. I also made it to fit on top of the other storeys, with slips nailed on all round to break the joint as at G (Fig. 2). Lest any one should not quite understand this verbal description, I give in Fig. 6 a side view of the roof as I have made it. The top consists of three boards laid edge to edge and nailed firmly to the sides; they are ½ in. thick and 27 in. long, the overlap all round being equal. The edges should be nicely rounded, and a piece of unbleached calico of sufficient size stretched tightly over the top, being turned under and secured by means of a lath nailed all round. The points of the nails should on no account pierce through the top, as they would cause the calico to be eaten away with rust. This top should be painted with several coats of lead colour, and it will then be perfectly watertight and last for generations.

The porch is made of ½ in. wood, as seen in Fig. 7. It is 18 in. long, and extends forward 6 in.; a space is rebated out in which the shutters slide, and I find broken sections act as well as anything for shutters. The strips, G (Fig. 2), are 2 in. wide and ½ in. thick; the top is bevelled to throw off the rain, and the edges all rounded; they are mitred at the corners or simply overlap. Two short pieces are placed at the front to cover the joint as far as the porch.

So much for the outside, which does not differ in any essential particular from those illustrated in Figs. 1, 2, and 3.

Mr. Cowan recommends Novice's metal corners for the frames, but as I wanted to use the ordinary frames with top bar 17 in. long, I had to alter the construction of the brood-nest somewhat.

My brood-nest consists of a box of ¾ in. pine dovetailed together. Its internal dimensions are 17 in. by 14½ in. The long sides are 8⅛ in. high, and the short ones 8⅞ in. Parallel strips of tin are tacked to the inside of the long sides, raising their height by ⅜ of an inch, and strips of wood are nailed to the outside, as seen in the section (Fig. 8), so as to make room for the long ends of the frames. I attach a piece of wood 1 in. wide to the lower edge, so that it would fit flush on the top of a similar brood-nest when used for doubling. If Novice's ends are used, the four sides of the brood-nest will be 8⅞ in. high, and it will be necessary to cut a rebate out of the long sides of the dimensions shown at Fig. 9, which also shows these metal corners.

The frame, L, in Fig. 2, which is used for winter packing, is simply of ½ in. deal. 4½ in. deep, and 17 in. square inside. The bottom is covered with a piece of unbleached calico, which is tacked on at the outside.

Instead of this, I commonly use the feeder cushion made by Mr. Abbott, which is represented by Fig. 10. It is made of ½ in. wood, and fits over the brood-nest like the other. The only difference is that the space in the centre is not covered with calico, the feeding stage occupying that position. It would be advisable to nail strips of wood ⅜ of an inch high round the edges over the calico to permit the bees to run freely on the tops of the frames. The hole in the centre will vary in size according to the kind of feeder used. That in mine is 5 in. square, which I find large enough to hold any feeder, except one, in my possession. In the winter, when feeding is over, I often fill that space with candy, and put a pillow on top to keep in the heat.

It is easy to calculate that, the external dimensions of the outer case being 22⅛ in., its internal measurements will be 20¾ in., for the boards will, when planed, be not quite ¾ in. thick. Then, the brood-nest being 18½ in. long, there will be a space of 1⅛ in. at each end to fill with chaff. This is less than shown in Fig. 3, but it will be enough; the space between the dummies, P P, and the brood-nest could be filled with a similar material if thought necessary. In the other direction, there will be more than 2¼ in. of packing, which is about the quantity shown.

The amateur will find this hive easy to make, and he could not do better than adopt it as the standard in his apiary.

I have now described three hives, which I think enough for the present. In time to come I may treat of twin hives, observatory hives, and the Stewarton. In my next I hope to write about the internal fittings.

NOTES ON GLASS PAINTING.

BY FRED. MILLER.

Ecclesiastical Glass Painting.

Glass painting is one of the foremost art handicrafts of the day. Up to fifty years ago, stained and painted glass was almost a lost art. Indeed, the art of making coloured glass required rediscovering, for the magnificent rubies, blues, yellows, and whites of the old windows that, surviving the ravages of time and the destructive hand of man, are still to be seen in just a few of our old churches could not be obtained of any of the glass workers of the early days in this century. We are greatly indebted to a lawyer, Mr. Charles Winston, for much of the knowledge of old glass, and for having revived the manufacture of it. Winston made drawings of old specimens, procured old fragments of glass that were to be found stowed away in the crypts of the churches, and he had these pieces analysed to see if it was not possible to find out their component parts. Success attended his efforts, and at the present moment some of the most beautiful coloured glass that has ever seen the light is made in London by Messrs. Powell, at Whitefriars. The art of making coloured glass was lost because there ceased to be a demand for it. In the last century a certain amount of glass painting was executed, but it took the form of elaborate engraving-like effects, like the Reynolds' windows in New College, Oxford, in which an attempt is made to produce the effect of a Rembrandt picture. White glass is used almost exclusively throughout, and the colour is painted on it as though the artist were working on a canvas. It follows that little light can enter through such windows, and consequently the effect is gloomy and entirely wanting in brilliancy, the particular charm of old windows. The old painted windows, executed by monkish artists, were put in for a double purpose. The subject of the windows was another of the many forms of picture writing that played so important a function in the education of the people when only the very few could read; and in addition to this didactic object the monks had in view, the painted, coloured glass softened the glare of the light, and produced a mellow quality within, which has been termed the dim religious light. What positive colour was introduced was the result of glass coloured right through its substance—coloured, that is, when the glass was in a molten state in the pot and hence termed pot-metal. What painting was done on the glass was of the simplest character, consisting as it did of outlines executed firmly in a brown colour on the surface of the glass and baked on it in a muffle kiln.

As it may be interesting to many readers to know how an old monkish glass painter set to work to make a coloured window, I will endeavour to make his *modus operandi* clear to my readers, for it is in all essentials the method followed at the present time, though with our modern resources we get over the work easier and less clumsily than he did. A table or board the size of the intended window was prepared and whitened, and upon this the artist drew his figure or composition in charcoal, using a few vigorous touches to produce his effect, but keeping everything severely simple and attempting nothing of a pictorial nature.

We will imagine the figure to be the representation of some saint in his robes of office. These latter would be made of coloured material, so glass of the required colour was taken and shaped to suit the particular part of the garment it was to represent. If it were a chasuble, it would necessitate making it in pieces, for sheets of coloured glass were never very large. The shaping of the glass was the most difficult thing the early painter had to do, for the use of the diamond was not then known. A red-hot iron was drawn over the glass in the hope that the glass would break in the way desired, but frequently it did not, and then the piece had to be filed and chipped down with pincers, a laborious and difficult task. The face, hands, halo, and other portions, such as borders and the architectural enrichments termed canopies, were made of white glass, and these had to be shaped. So that, roughly speaking, a coloured window resembled a mosaic on a large scale, every different colour introduced necessitating the shaping of the required piece, and in large surfaces it meant the joining of several pieces together. When all the various pieces of glass forming the design were shaped, the next thing to be done was to trace the design in a brown colour. The

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painting consisted of putting in the features and hands, folds in the garments and patterns on the same, and any ornament on the backgrounds. This colour had probably an iron base with a fusible flux mixed with it, so that when the glass was raised to a cherry heat, the colour was indelibly fused on to the surface of the glass. The next operation was to join the several parts together by means of bands of lead with grooves on both sides to receive the glass. On the completion of the window we have a large glass mosaic, every part of which is strongly outlined by the leads which hold the whole together with the addition of the painted work, which does for each individual piece what the leads do for the general design. The object the glass painter keeps before him is to make the leads, as far as possible, outline the several parts of the design, and though in large surfaces merely arbitrary leads are introduced whose object is merely use, yet if we look at an old window as a whole, we find that the leads, in addition to binding the whole together, serve to outline and emphasise the design, and the skill of the glass painter is shown in the successful way he makes the leads to form an integral part of the design. The earliest specimens of painted windows in existence are to be seen in France, and date from the ninth century. We have some specimens of old glass at York Minster, Fairford, in Gloucestershire, New College, Oxford, and other places, but owing to the great destruction that took place during the Cromwellian wars, our ancient buildings are not rich in old glass, and we possess nothing like so fine a collection as the French. A good deal of modern painted glass is as fine as any of the old in colour, and owing to our increased knowledge and improved appliances we can impart a finish and delicacy to our windows that the earlier men were quite unable to effect. But it is the severe directness and archaic simplicity that gives old glass its charm. Then their means being limited and their resources few, a simplicity was attained which it would be better if we in much of our work strove to reproduce. Modern glass often errs in over-elaboration, and in an attempt to overstep the limits of the art. If we cover the glass with pigments we destroy its transparency, and consequently lose brilliancy and that gem-like quality possessed by old glass. And if we do not keep our designs sculpturesque, the window when seen from a distance looks confused. The Reynolds' windows in New College, Oxford, have a dingy look, so entirely is the glass covered with colour. The leads, too, are not wrought into the design, but as far as possible are hidden. In fact the chief aim was to produce the effect of an oil painting, and that is not the way to treat glass, for however successfully it be done, we only feel how impossible it is to paint a picture on glass.

THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

First Work in Modelling.

THE BEST SUBJECTS FOR BEGINNERS—NECESSARY APPLIANCES, MODELLING STOOLS, ETC.—BUILDING UP AND ROUGHING-OUT—WORKING ON THE MODEL—FLESH MODELLING—TOOLS OF VARIOUS KINDS, AND ADVICE REGARDING THEM—FINISHING.

IT might be inferred that the most suitable subject for first lessons in modelling would be some simple piece of ornament, and, indeed, the art is often taught thus. The best teachers, however, take a different course, and for this reason—in mere ornament there is comparatively little which can be done without tools, whereas it is important that the novice should first learn to model with his thumbs only as much as possible; and it will be in some portion of the human figure that he will find those large forms and broad surfaces which will give freest scope for the use of these. They therefore recommend that early practice should be chiefly from the figure, even though the ultimate aim of the student should be to become a modeller of ornament. Whatever is modelled, there will always be ample opportunities for working with tools.

The most approved practice is to copy from casts of the antique statues. Apart from any benefit to be derived from thus familiarising the eye to fine form, casts are the best things for the learner to copy from. They are rigid, and do not change, and do not therefore perplex a novice, as does the living subject. Also the lights and shadows on them are clear and decided, which is a great point, for it must be remembered that it is wholly through the shadows cast by it that the modeller is able to recognise and reproduce form

When sculptured figures are of a size only slightly larger than

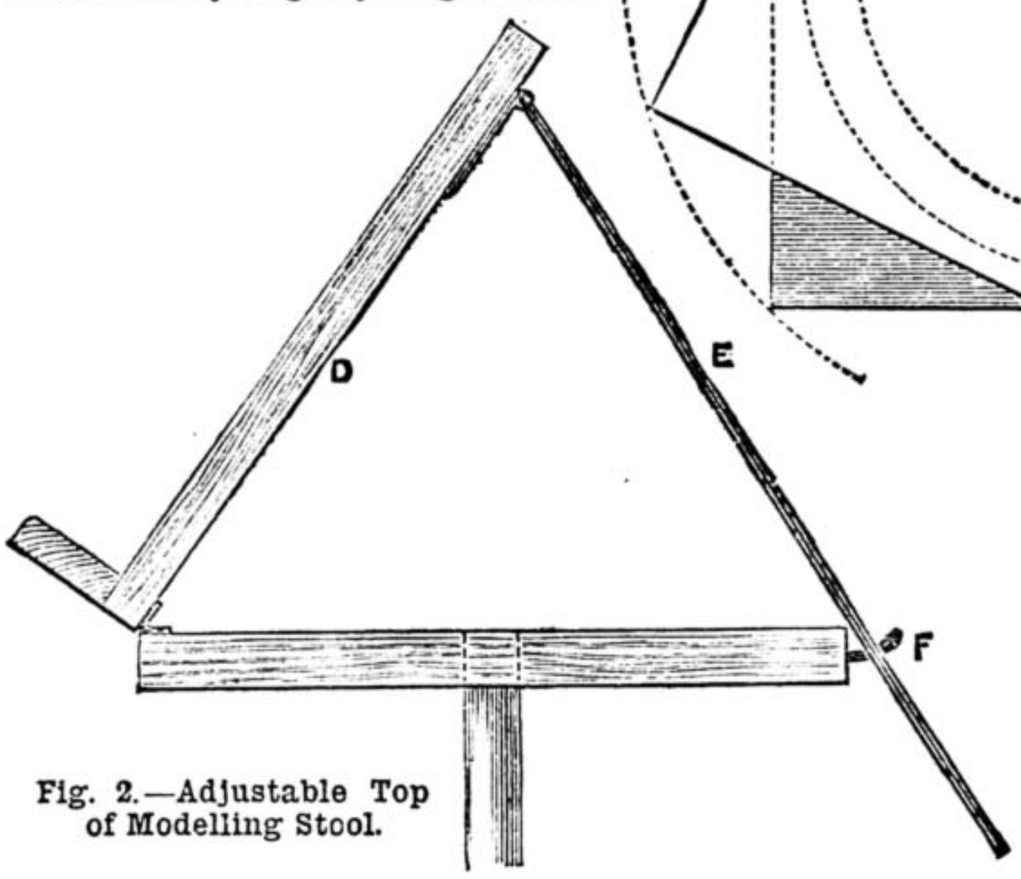

Fig. 2.—Adjustable Top of Modelling Stool.

life, they are termed "heroic;" but if they greatly exceed life-size, they are termed "colossal." The best subject on which the aspirant to modelling can make his first essay in the art will be some portion of a colossal statue. He should procure a cast of the hand, or foot, or mask (that is, merely the face) of such a statue, and copy it in clay as closely as he is able, availing himself of the use of callipers and compasses to get all his dimensions accurate.

But before he sets about this he should have some knowledge as to the necessary accessories to his work. He must have some sort of modelling stool, and he should have one which will not only serve for matters like the present, but also for the busts, statuettes, etc., on which he will exercise his skill by-and-by. A useful stool will be one some 3 ft. 3 in. high, and with a top some 15 in. square. The stool should be stoutly made, for models are heavy; the legs should incline slightly outwards, to give greater firmness; and the top should have a turn-table. This latter arrangement is necessary in order that all parts of the work may be readily brought under the eye, and into different lights. Fig. 1 is a diagram of a turn-table. The top, it will be seen, is double. In the middle of the lower part is a round hole, through which passes a pin or peg, A, fixed in the middle of the upper part; on this the latter revolves. In the upper face of the lower part are fixed four little metal wheels or rollers, B B B B, and on the lower face of the upper part is a circle of iron, C C, which runs on these rollers. This enables the top to be easily turned, however heavy the weight upon it.

A useful form of top which may be made to fit on the same stool as the last is shown in Fig. 2. It is one that comes in handy for reliefs, etc. The board, D, is fitted to the upper half of the stool-top with hinges, and may be adjusted to any desired angle by means of the tongue of iron, E, which,

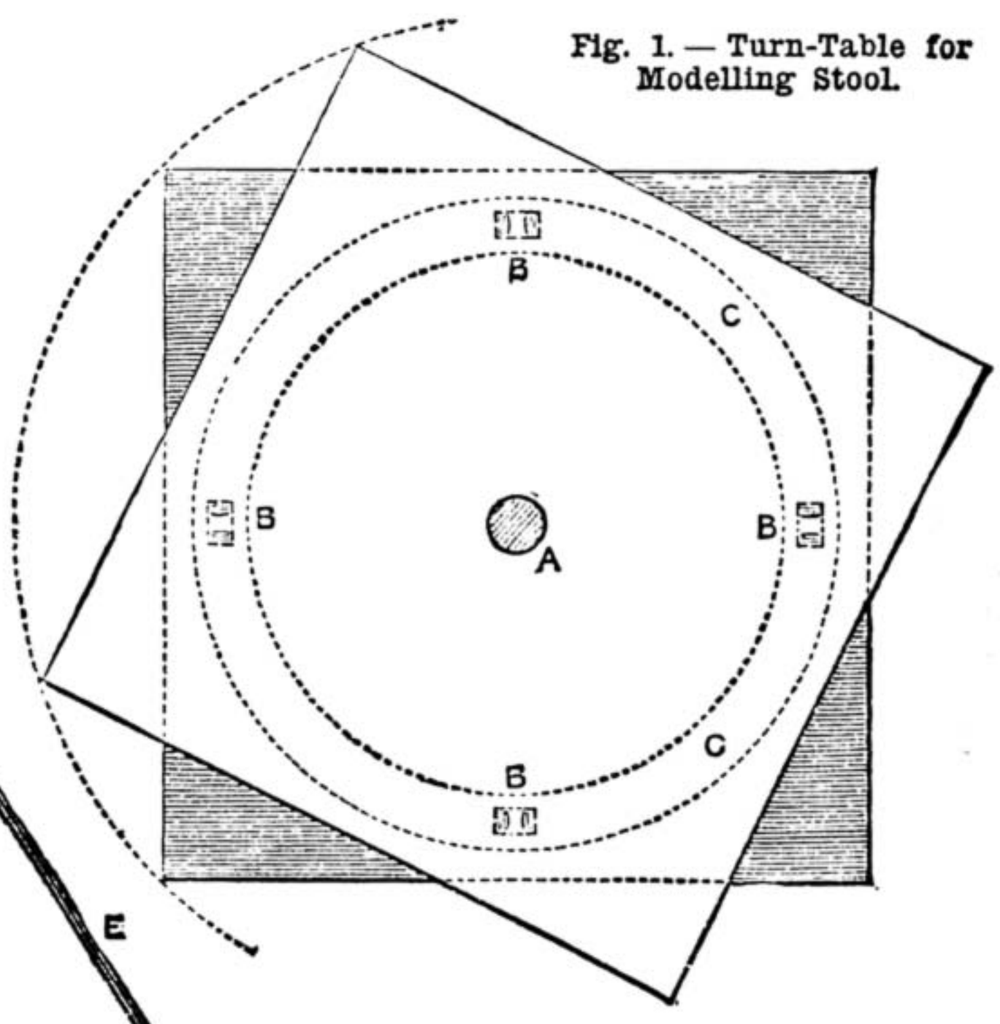

Fig. 1.—Turn-Table for Modelling Stool.

being pierced with a series of holes, hasps over the pin, F. The tongue has, of course, a hinge attachment to D. This arrangement not only allows a relief to be readily turned to get new lights, but also enables the model to be most easily laid on its back for wrapping in wet cloths.

Modelling stools, like music stools, are sometimes made with a screw, which allows them to be adjusted to different heights. Theoretically, this is a convenient arrangement, but it does not always work well in practice. Such stools are apt to be the reverse of firm, whereas a firm stool is essential to satisfactory modelling. Without any screw, it is always possible, if the model is too low, to pack under it; and if too high, the modeller can readily find something on which to stand. The modeller, it should be observed, commonly works in a standing posture. He may sometimes sit whilst working on small reliefs, or whilst finishing details; but on anything of size and importance, especially whilst roughing-out—whilst determining general forms and throwing in action and expression—he needs to put forth that energetic labour, and to assume those varieties of position, which are compatible with standing only.

Placing his cast as near as is convenient, and on a level with the top of his modelling stool, the worker proceeds to build up his model in clay. As a foundation for it he

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will have laid a piece of board or slate on his stool. Taking a lump of the prepared clay, say of the size of a couple of fingers, he will slightly roll it between his hands so as to form it into a kind of rude cylinder, and lay it in what is to be the middle of his model. With his thumb he will press it down closely to the board beneath, which will have been previously damped. Then he will take another roll of clay, and lay it beside the first, and by drawing his thumb along it will so work it down as to make it adhere closely to that already laid. This is to be done firmly and quickly with a single motion of the thumb. It is desirable that the clay forming a model should be made into one compact mass, with no air spaces left within it, which if left are liable to be a source of future trouble; for if in the course of working the air is gradually pressed out from these, the clay will sink in, and depressions on the surface will result.

And with this process the modeller goes on, adding rolls of clay and working them down till he has built up the bulk of his model. He will do this almost entirely with his hands, only using a large roughing-out tool occasionally. Figs. 3, 4, 5, are roughing-out tools; for his present purpose he will find No. 5 of most service.

When clay is thus first put together, it is highly plastic; it yields readily to every touch, and may with ease be bent, or moved, or altered at will, and in a model of no great size like the present, it is therefore well to get the roughing-out pretty much done in the first day's work. It is less easy to make considerable alterations after the clay has had time to stiffen and set, though the firmer state is necessary for the putting in of details and for finish.

In roughing-out the model the beginner is apt to feel tempted to make the masses unnecessarily large, and to cut them to shape with his tools. As far as possible he should avoid doing this I do not say that he should never do it, for it is among the advantages of the modeller's art that he can freely add to, take from, or alter any part at his pleasure. But building up is the proper method, and the way to a good style of modelling. He will, therefore, as he roughs-out—with a view to the additions to be made in finishing—keep everything somewhat smaller, and especially somewhat narrower, than his cast. He will also do well, instead of curves and rounded surfaces, to make angles and planes serve to represent the forms he sees before him, leaving the softening of these into curvatures to be the result of his after-work. In modelling, as in drawing, the most masterly sketching-out is always angular.

A few hours serve to stiffen a small mass of clay sufficiently to fit it for more careful work. The clay has now to be laid on in much smaller pieces, which the worker generally rolls with his thumb and finger into little pellets as he goes on; this more thoroughly tempers the clay, and makes it work more smoothly. Going on in this way, he gradually copies upon his model every form that he sees in the plaster cast. He occasionally turns both cast and model, that he may see them under different lights; for it is easy to be deceived as to any delicate form if it is seen in one light only. It is better to work by turns on all parts of the model and to keep every part pretty equally advanced, rather than to work on and advance any one part to the neglect of the rest; for thus only can the modeller see whether his work generally is progressing properly. In his anxiety to see the effect of what he is doing, the beginner is sometimes tempted to build up parts too hastily, without blending and working down his clay properly as he goes on; this he will find in the long run to be making more haste than good speed.

In modelling flesh it is quite possible to give a good finished surface in the broader parts with the thumb alone, and the learner should try to do this; but in the smaller parts, for which the thumb is too large, there will be a necessity for using tools to shape and smooth; and about tools a word or two should now be said.

The modeller's first and best instrument is that of Nature's providing, the thumb; and next to it come those artificial tools which most closely resemble the thumb in shape. Of this class of tools, Fig. 6 may be taken as a type. These are sometimes called "spoon-shaped tools," but they ought to be less pointed than an ordinary spoon, and more nearly to resemble the thumb in the breadth of their ends. In the illustrations given, all the tools are drawn to half their actual size; and all, except the wire tools and flat roughing-out tools, are drawn in profile as well as in front, in order that they may be worked from.

The material for tools is some hard, smooth-grained kind of wood, commonly box. The modeller can buy tools, if he chooses,

[*For continuation, see page* 126.]

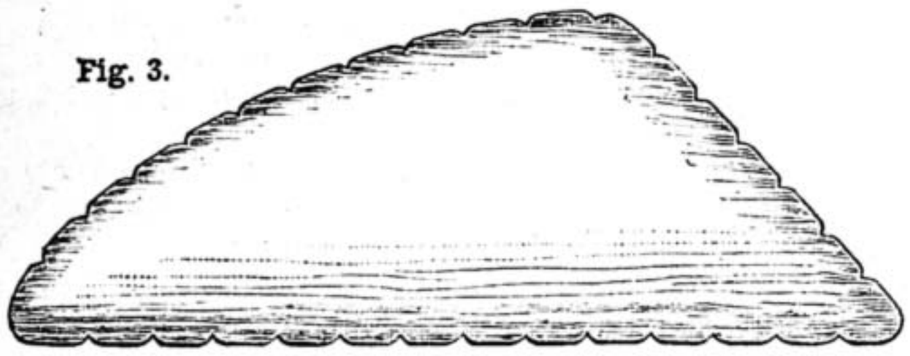

Fig. 3.

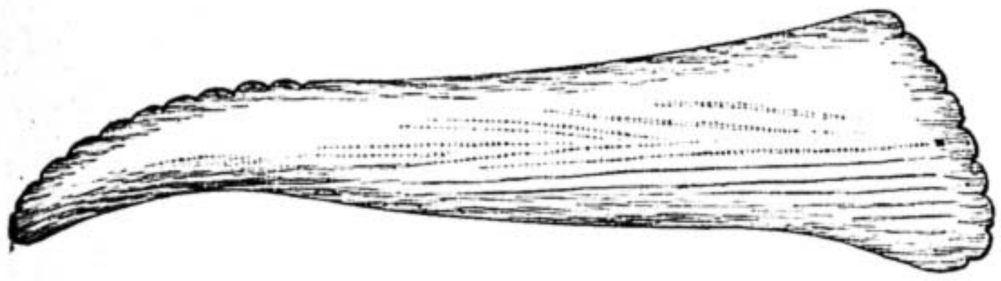

Fig. 4.

Fig. 5.

Fig. 9.

Fig. 10.

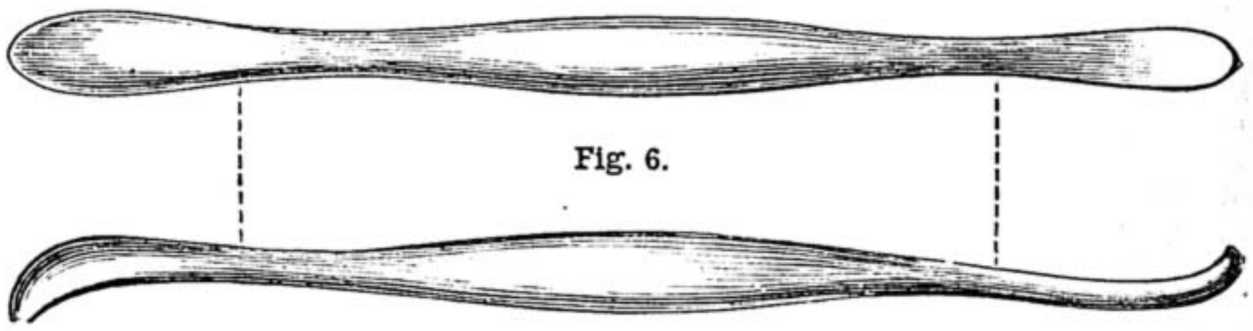

Fig. 6.

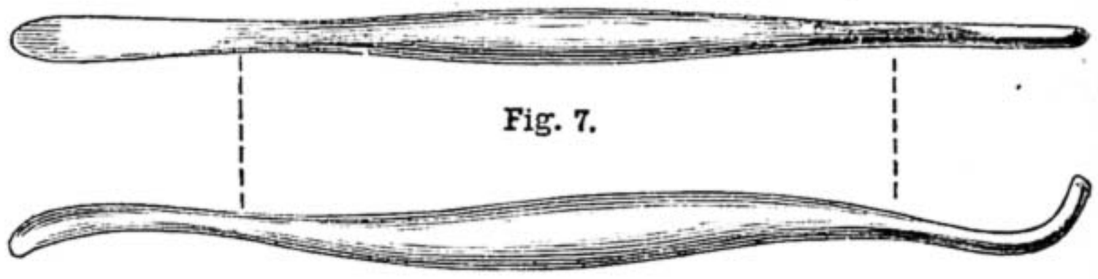

Fig. 7.

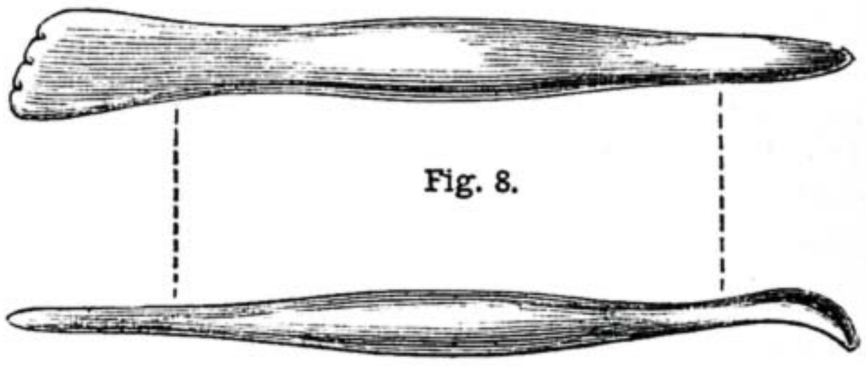

Fig. 8.

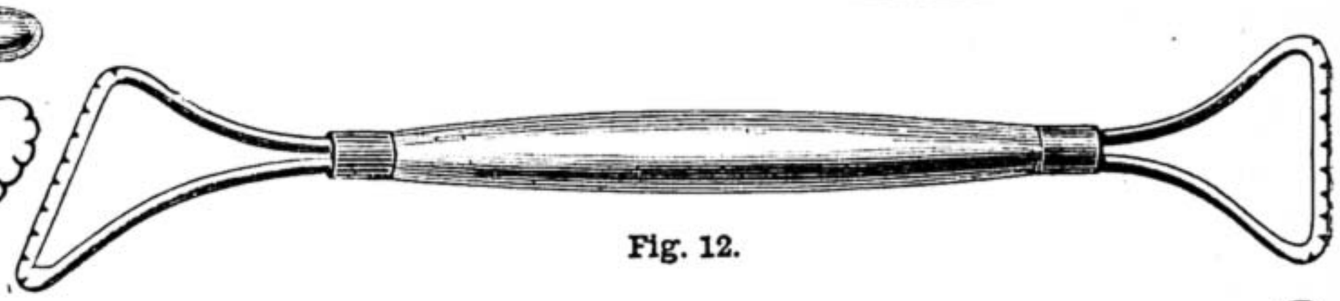

Fig. 12.

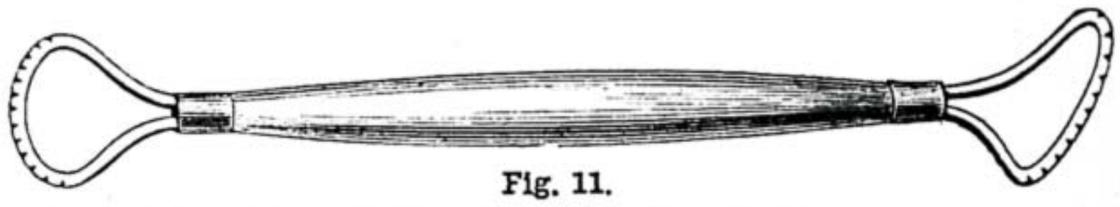

Fig. 11.

Figs. 3, 4, 5.—Roughing-Out Tools. Figs. 6, 7, 8, 9, 10.—Modelling Tools. Figs. 11, 12.—Wire Modelling Tools.

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Carved Panel for Cabinet.

SUBJECT—THE YELLOW IRIS. (SCALE, HALF SIZE.)

Carved Panel for Cabinet.

SUBJECT—THE POET'S NARCISSUS. (SCALE, HALF SIZE.)

at shops at about 6d. each; but those sold are rarely of good forms, and are often useless. Instead of wasting money on them, the worker is advised to make his own from the drawings given. With a chisel, a knife, a file, and sandpaper, he will find no difficulty in so doing; and he may then be sure that he has forms of proved value. At the beginning he is advised to content himself with merely three or four tools, and he will soon find out what others he requires, and what forms suit him (for different modellers fancy different tools), and he can make such as he requires.

Whenever tools are intended for scraping (as in Fig. 10), their edges should be notched so as to form a tooth, as they are in that example: with a toothed edge they make better work in every way. Fig. 8 is a tool which will be found especially useful in working hair. It will be observed that about none of the examples given is there anything sharp or angular, and this is a thing to be noted. Not sharpness and harshness, but softness and breadth, are the qualities which an artistic modeller desires to gain.

Small tools are made of bone or ivory. For fine work a bone tool resembling Fig. 6, only with two-thirds of its length and one-third of its bulk, would be found most useful.

Figs. 11 and 12 are wire tools, of which one or two are desirable, since no others serve so well to scoop out or to scrape down when the clay model has become somewhat hard. They are made of brass wire fitted to a handle, and in its working part the wire is somewhat flattened and notched on one side with a file, so as to give teeth. These tools are not so easily made, and though some modellers make them for themselves, most persons prefer to buy them. They cost about 8d. each.

As the first work approaches its finish, some difficulty will be found about the broad flesh surfaces. Instead of being even and regular, they will be "lumpy;" they will have hills and hollows where such things ought not to be. This will be caused by a want of firmness in modelling with the thumb, a fault which can only be corrected by practice. There are, indeed, dodges by which the difficulty may be partly overcome, and a passable surface produced by mechanical means, and of these mention will be made by-and-by; but of these the novice will be better to know nothing for the present. As yet, let him practise to get good firm surfaces with his thumb, for thus only can the more delicate curvatures be expressed with due tenderness—thus only will he be able to attain to what is called "feeling" in his modelling.

The tyro is generally hasty in pronouncing his work finished. Let him be warned against this. Instead of speedily resting content with his work, let him look over it again and again with care, and he will be sure to find many things which may be improved. High finish may not be of high importance in this his first effort, but he should discipline himself for his after-labours. A habit of thorough care in finishing is most desirable. As a rule, which it is desirable to observe, everything ought to be well finished in the clay, and nothing left to be done in the plaster.

When really finished, the young modeller will doubtless be so well pleased with his work as to wish to preserve it by casting. It will be well that this should be done, not that the cast will be of any value whatever, but that, by future reference to it, he may see what progress he is making.

CARVED PANELS FOR CABINET.

BY J. W. GLEESON-WHITE.

Iris and Narcissus.

These designs for carved panels were intended for the folding doors of a small cabinet, but can be adapted to a variety of purposes, since an oblong upright panel is frequently useful.

The pattern is so arranged that for those who wish to shirk the labour of carving out of the solid, the design may be traced and cut out with a fret saw, in wood about ¼ in. thick, and then mounted on a block of the same wood for carving. When practicable, it would be best, in working this way, to saw the thin section for fret cutting off the solid block, so that when replaced, the grain of the wood should correspond exactly in each instance.

The idea of each panel is a single group of the plant, with some lesser flower nestling about its foot-stalks. The stalks and the leaves of the principal flowers are planned so that they appear to grow up through the dividing bar of the panels.

In carving all natural objects, no design can give the suggestion that an actual flower supplies. Yet it must not be forgotten that in conventional carved work, a broad effect, whereby the more salient points of the flower are seized and treated boldly, is preferable to a painfully minute and laborious imitation of every detail.

The yellow iris and the poet's narcissus are both adapted for this treatment, as the simple masses of their form can be expressed with comparatively little detail.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

15.—Moseley and Son's Wood-Carver's Router.

Wood-carvers have long been in want of a handy little tool such as this for clearing away the bottom of wood that has to be removed in relief carving, and producing an even and level surface. Similar appliances, it is true, have been made by handy workmen for their own use, and have been supplied, I believe, to pupils connected directly and indirectly with the School of Wood Carving, South Kensington, but this is the first tool of the kind that has been made and put into the market by a tool maker, and can, therefore, be obtained by any one who wishes to have it without favour or affection, as the saying goes. Its form and nature may be gathered from Figs. 1, 2, and 3, which represent the front elevation, end elevation, and plan, or, rather, view of the bottom of the Wood-Carver's Router recently introduced by Messrs. Moseley & Son, and sent by them to any address, post free, for 1s. 3d. The iron is 2¼ in. long and $\frac{3}{16}$ in. full wide. The stock or body of the router is 3⅞ in. long, 1 in. wide, and ⅝ in. deep. The bottom in front of the iron is slightly grooved, as will be seen on reference to Fig. 3, to admit of ready clearance of the bits of wood cut away by the iron. The tool, which is made of beech, is nicely finished. The iron is easily and quickly regulated to suit the depth required.

16.—Plane Iron, Chisel, and Tool Sharpening Machine.

This excellent adjunct to the carpenter's bench has been recently introduced by Messrs. Moseley & Son, 323, Holborn, London, W.C., who are selling great numbers of them to professional workmen as well as to amateurs. The machine itself is made on Plested's patent, taken out in 1888, and is sold at 8s. 6d. Its principle and action will be easily understood from Fig. 4, in which a plane iron is shown in the proper position for sharpening from a base, which is screwed

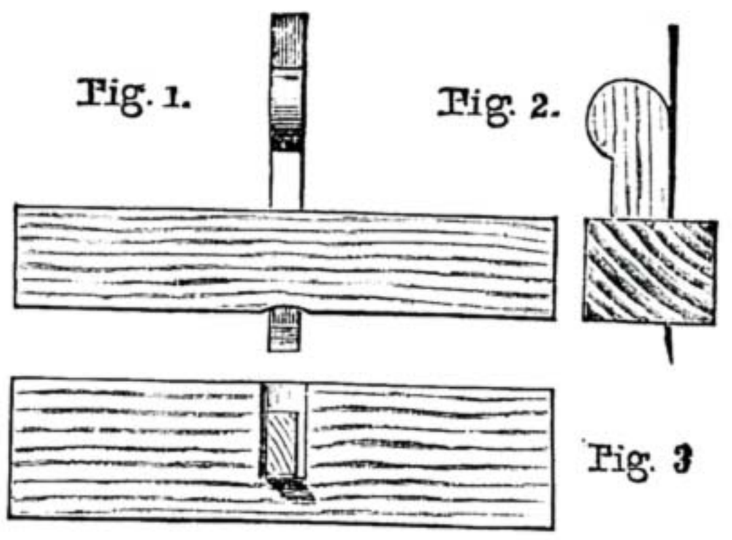

Fig. 1.—Wood-Carver's Router: Front Elevation. Fig. 2.—End Elevation. Fig. 3.—Plan.

down to the bench or any convenient stand, rises two standards, which carry a steel cylinder about 1¾ in. in diameter, flanged at the ends like a cotton reel, and an adjustable back, which affords the means of increasing or diminishing the distance between the cylinder and the back, according to the thickness of the iron to be sharpened. The cylinder is turned by the handle with one hand while the iron is held in place with the other. It must be borne in mind that the machine is intended to take the place of the oilstone, not the grindstone, which must be used to take out deep notches, etc. It is claimed that the work done has a better finish, and that a boy can sharpen a plane iron and get a better, truer edge in less time than an experienced workman could with an oilstone. The roller must be

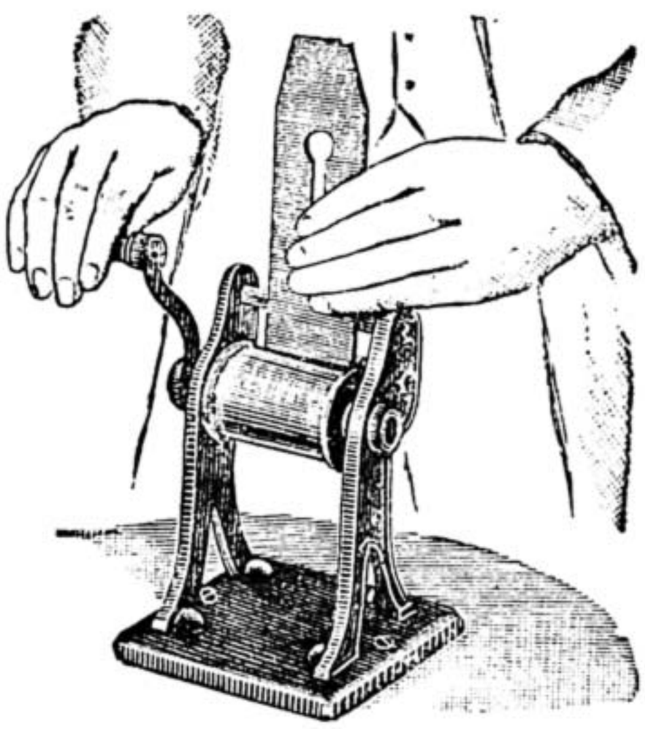

Fig. 4.—Plane Iron, Chisel, and Tool Sharpening Machine: Plested's Patent.

coated all over with oil—the same as is used for the oilstone—and then sprinkled with flour emery or knife polish. The iron should be held as shown in Fig. 4, gently pressing it against the roller, and, at the same time, keeping it against the rest on back of machine. Very little, if any, emery is required after the iron or chisel is once well sharpened, and the finer the edge required, the less emery is wanted. A slight burr will be found on the face of the tool sharpened, but this is removed by a slight rub on the roller. If there is too much burr, it shows that the back of the machine is too far over the roller, and requires adjustment. It is a nice handy tool to use, and certainly saves much of the labour expended in rubbing down a chisel or plane iron on the oilstone. The only thing it does not do is to take off the corners of a plane iron in the orthodox way.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

*** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Slide Valve. — A CORRESPONDENT writes:—"There seems to be a somewhat serious error in the paper on the slide valve on page 810, Vol. I., top of middle column. 'Next the total lead is ¼ in.; set the dividers to that radius, etc.' The lead was previously stated to be ¼, and that is the distance to set off. Again, 'Having done this we take the total lap, which is 1½ in.,' but the lap was stated to be ¾, and that is the proper distance to set off—or altogether, ¼ + ¾ = ¼. ¾ is the proper distance to set off from *o* to *b*. The expressions 'total' lead and lap are quite new to me. Lap is not 'the distance the slide valve overlaps the opening edge of the steam-port (port *l*) at the end of its travel.' It is the distance by which the valve overlaps the port when the valve is in the middle of its stroke."

[To avoid any mistake the best plan is to lay down a working plan upon a board full size, get the angle required by the lead, plus the lap, or make a templet. Lap may be taken in the following manner: take a lathe or straight-edge, place it upon the slide face, mark the length of it on the lathe; then put it on to the cylinder's face: the distance between the marks of the slide face and the outside edges of steam ports, when centrical, is the lap of the slide. —T. R. B.]

Paint for Blackboards.—J. H. (*Leicester*) writes:—"I have noticed several inquiries for paint for blackboards. The following will be found of great service:—One pint of methylated spirits; 2 oz. shellac; 1 oz. best ivory black; ½ oz. fine emery flour; ½ oz. ultramarine blue. Dissolve the shellac in the spirits before adding the other ingredients; mix well, and keep in a corked bottle. To apply, see that the board is free from grease, and only pour out as much as required. Any one using this paint will not complain of the chalk not biting."

Trade Usages, Oilstone, etc.—H. B. (*Jarrow-on-Tyne*) writes:—"In reply to B. A. B. (*Hampstead*) (page 27, Vol. II.) in *re* bore *v.* drill, he says, 'I can assure him no competent instructor ever taught him that the distinction depends on the material operated on.' I don't think I said any competent instructor ever taught me the distinction, and I don't see why he should aver that I 'evolved the information out of my inner consciousness.' I went by the general usage of the trade; for instance, I am working on board ship, if I were to ask one of the drillers to come and bore me some holes in an iron beam or bulkhead, I fancy he would look at me; or if a chap asked me to lend him a gimlet to drill a hole I should rather look at him. In reference to the word munting, I rather looked when I found you had made me to say that the outer vertical parts of a piece of framing were called mullions, I can scarcely think I wrote outer, but as I did not keep a copy of the letter, I would not like to be positive; anyway, I meant inner, and I did not write sooner to correct it thinking that any one with half an eye would see that it was palpably a mistake. Would B. A. B. kindly inform us if the distinction between bore and drill does not depend on the material operated on, what it does depend on? I beg to thank BRASS (*Wolverhampton*) for noticing my inquiry. Would you kindly inform him that my name and address is H. Berry, 50, Lord Street, Jarrow-on-Tyne. If any wood-worker has an oilstone that is too hard to be of any use, let him not discard it, but try a pinch of flour-emery with the oil he uses, and, I think, he will open his eyes at the difference it will make. I keep it in a pepperbox, and just dust a little on each time I put some oil on."

Erratum.—W. D. writes:—"Telephone Transmitter (see page 45, Vol. II.). In line twenty-four from bottom centre column for "shown in Fig. 3," read "shown at A A, Fig. 1."

China Riveting.—W. W. (*Westminster, S.W.*) writes:—"I have found by personal inquiry and practice that the best place to get all the tools, and also the cheapest, is Woods & Toussaint, 54, Spencer Street, Clerkenwell, London, E.C. I write this for the benefit of your readers, and to save them what it cost me to get the information—much time and experience."

Water Motor.—J. M. (*Stockport*) and several correspondents write in reply to MOTOR (see page 30, Vol. II.) expressing their satisfaction with the "Demon" Water Motor. Other correspondents have written in an opposite strain.

II.—Questions Answered by Editor and Staff.

Books on Alloys.—A. B.—As your son is learning the silversmith's art, he will get some good useful information on silver and its alloys from the "Silversmith's Handbook," by G. E. Gee, and also the "Goldsmith's Handbook," by the same author, both published at 3s. 6d. each. Bloxam's "Book on Metals," price 3s. 6d., will be also useful. For the analysis of metals, he should get Mitchell's "Manual of Assaying," price 12s. 6d. He will also find much information on the treatment of metals in Cassell's "Technical Educator."—G. E. B.

Electric Bell.—W. S.—Get Nos. 12, 18, and 20 of WORK, and read therein all that is printed on the subject of burglar alarums. You will then know how to make an electric bell.—G. E. B.

Burglar Proof Sash Fastener.—R. W. (*Manchester*).—Send to Rd. Melhuish & Son, Fetter Lane, Holborn Circus, E.C., and state your requirements. I think they can be met by that firm, at a cost of 1s. 6d. each sash fastener.—G. E. B.

Lithographic Transfers.—W. E. (*Nottingham*).—As the face side of any lithograph is, when transferred to glass, the undermost, the colours should be printed exact the inverse way, *i.e.*, the key should be printed first instead of last, and the other colours in exactly the opposite order to that in which they would be printed for ordinary chromos. The paper may be prepared with any composition which is soluble in water, if coated with albumen (white of egg), dextrine, or ordinary lithographic transfer paper composition; so long as it is soluble in water it will answer the purpose. To cause it to adhere to glass, either use as a last printing any composition containing Canada balsam, gold size and terebine, Venice turpentine or other ingredients which soften and adhere with the application of slight heat under pressure, or use tacky varnish on the glass itself. We point out the theory in preference to giving any particular formula. After paper and print are fixed to the glass surface by means of gentle heat, cold water soaking will bring the paper off. Use the ordinary litho inks, as strong and stiff as they can be used, to lift, and be sure to let them thoroughly dry between one working and another; they will keep for years. Another useful process is to have a roller in contact with the printing cylinder of the machine covered with soft flannel, and with light springs. The cylinder is to be tightly covered with indiarubber blanket, on which the colours one after the other "set off," and are again "set off" on to sheets of glass, tin, etc., as they pass between the printing cylinder and its soft-covered pressure roller. Note that in this method the drawing on stone must not be reversed but be drawn right way about, so that when reversed on the rubber it may be re-reversed and come right way about on the glass or tin. W. E. must, however, be careful he does not infringe somebody's patent rights, as those matters are the subject of numerous patents. See also answers to YOUNG CABINET MAKER and KESSIE (*Bristol*).—J. W. H.

Dynamo Construction.—H. S. (*Bebington*)—Your friends have anticipated the articles, and I have anticipated your wish for them. When you wrote, we had not then published a series of articles on dynamo construction, but I had written one on this subject as part of a short series dealing with "Model Electric Lights." In this series, when it appears, I think you will find all the information required by you.—G. E. B.

Water-Glass.—C. T. T. (*London, E.C.*).—The manufacture of water-glass is not suitable for amateurs, as you will see by the following extract from a standard work:—"It is usually prepared by boiling silica with caustic alkali under pressure about 60 lbs. to the square inch in a digester."—L. J. P.

Papier-Mâché, Moulding in Low-Relief.—W. D. G. (*Roehampton, S.W.*)—This I have never seen done, but it appears to me that the plan proposed by W. D. G. would be satisfactory, though tedious. Adopting his idea, I should suggest that the sharpness of edge resulting from the successive layers of paper should be softened down with fine sandpaper before the final coat of *thin* paper is pasted over the whole. And I would offer another suggestion, that before applying the gold, a little finely powdered rotten-stone should be mixed with the oil of the priming. The slight roughness thus attained would help the effect of the gilding. From the letter of W. D. G. it would appear that he either wishes to mend an antique carved frame, or to make an imitation of one. Might not his better plan be to make a model of a single "reheat" of his ornament in any ordinary modelling material? Get a cast (intaglio) of this in iron—a most inexpensive matter—and press the papier-mâché or stereo pulp into it. Then, when his deal board is well seasoned, glue this to the wood, and gild as before, though a papier-mâché panel would be better. If the design reheats he will see that this will save much labour. Any porous paper of medium thickness is suited for pasted papier-mâché. Messrs. McCallum & Hodgson, Summer Row, Birmingham, get a special papier-mâché paper made to order; and they supply wood pulp, but for the present purpose probably stereo pulp would be better. For the work proposed special tools could scarcely be needed; and W. D. G. should be warned that in making a compound article of wood and papier-mâché there will be risk unless he can thoroughly depend on his board, for it is probable that the two will not expand and contract equally together.—S. W.

Printers' Ink. P. N. (*Keighley*) wishes to know how to make printers' ink to use with a cyclo-style. If I were to advise P. N. it would be to buy what he requires, for at any rate it is a messy compound, and I think he could buy it cheaper than he could make it, unless he requires it in larger quantities than I suppose. Boil the best linseed oil in an iron pot. When boiling set it on fire for a short time; this increases its drying qualities. When it is extinguished boil again, and dissolve resin in it to give body to it. Lampblack is then mixed with it whilst hot. It must then be poured out and ground to a smooth uniform paste. Perhaps the following will be better:—9 oz. balsam of capivi, 3 oz. lampblack, 1 oz. Prussian blue or indigo, 3 oz. Indian red, and 3 oz. dried turpentine soap. Mix together and grind up with varnish made of boiled linseed oil prepared as before described. This, if properly ground with a muller, will give a good ink; but I would repeat that I do not think it will pay P. N. in any way to make it in small quantities; it would be better to buy it of a dealer.—O. B.

Barbotine Modelling.—W. D. G. (*Roehampton, S.W.*) asks for suggestions for this work. The following is the method of procedure adopted by a friend of mine who is clever at it. For tools he uses the same as for modelling in leather, but depends chiefly on the fingers. The material used by him is gutta-percha, such as that employed and sold for soling boots. This being too thick for his purpose, he puts it into a saucepan of hot water, and boils it till soft enough to be rolled out to the required thinness with a *wet* rolling pin. From the thin sheet thus produced he cuts out his petals, leaves, etc.; and after softening them in hot water, bends and twists them with his fingers as he sees fit, using where necessary the leather tools, the round-nosed one and the fibring tools being most in requisition. The leaf or petal being made to his satisfaction, he chills it by plunging it into the coldest water he can get, which makes it surprisingly rigid. Berries he rolls round in the hands, or sometimes forms them in a bullet mould; stems can also be rolled between the hands. The principle of the modelling is, it will be seen, to shape by softening the gutta-percha with hot water, and then to make the part shaped rigid by chilling with cold. When all his parts are ready for joining together, he takes gutta-percha solution (*i.e.*, gutta-percha dissolved in naphtha), puts a little of this on the parts to be joined, warms them at a gas jet or candle, sticks them together, and lets them cool. For applying the ornaments thus made to a jar, this also has to be warmed, and the decorations fixed on by the same means; after which he paints the whole. The jars, vases, etc., which he decorates are of a porous or semi-porous ware.—S. W.

Steel Springs.—SANCHO PANZA.—The reply to STEEL SPRINGS will be correct as regards hardening and tempering. To temper in quantity use a sand bath, or an iron box.—J.

Patent Medicine.—W. H. (*London, N.*).—We must take this long string of queries *seriatim*. (1) To quote from an official circular of the Patent Office, "Many medicines are vended under the Government stamp as 'patent medicines' which have not been made the subjects of patents;" and again, "The use of appropriated medicine stamps does not have the effect of letters patent, but such stamps are only supplied to the person for whose use and at whose cost the plate from which they are printed was prepared, or to his authorised agent." We presume, therefore, that the mere Government stamp will not give to W. H. the security he requires with a view to selling his prescription or forming a company for its production, and that he will need a patent. (2) Acting on the instructions given in our article he should procure provisional protection. He can then safely treat for its sale to an individual or company. (3) To give any opinion as to the probable success of his undertaking is beyond our province or power. (4) We have in our article pointed out the method of proceeding when securing a trade mark. It is highly important to make choice of one about which no mistake can be possible—one which a child could recognise. A monogram or any involved subject is bad. But protection will be needed before the trade mark. (5) Probably no more widely-spread mediums for advertising can be found than Messrs. Cassell's publications. (6) We are not aware that any medical qualification is needed before patenting a medicine. (7) If W. H. proposes to act as his own patent agent he will, perhaps, do well to get (for a few pence from the Patent Office) the specification of some medicine already patented to serve as a guide. In selling the medicine, a Government stamp will under any circumstances have to be used. Communications respecting the preparation and supply of such stamps must be addressed to the Secretary Stamps and Taxes, Somerset House, London, W.C.—C. C. C.

International Patent Rights.—F. L. (*London*) should get a copy of the "Text of the Convention," which may be had for 2d. through any bookseller. This will give him authoritative information as to advantages which are secured to the inventor by the International Convention for the Protection of Industrial Property. His remaining queries he will find solved if he reads the answers to other correspondents on Patent matters.—C. C. C.

Taking Out a Patent.—C. E. M. (*Wisbech*) asks how he should proceed with regard to an invention which he wishes to sell. He should first

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secure provisional protection according to instructions given in our article. As regards the selling, there are established commission agents who transact business between patentees and manufacturers, and are paid by a percentage on the purchase money. C. E. M. will probably receive circulars from some of these agents directly his application is accepted. If not he can consult a London directory.—C. C. C.

Patent Rights.—H. B. C. (*Glasgow*) is warned that the law does not allow him either to "make or vend" an article patented by another person. He lays himself open to an action. Many persons have an impression that they have a right to make a patented article for their own private use, but this would appear to be a popular error. His only legitimate course is to purchase the right to make and sell from the patentee.—C. C. C.

Index to WORK, Vol. I.—J. R. (*Skerries*) and numerous other querists are informed that an Index is prepared, and is on sale, by the publishers, Messrs. Cassell & Co., London, E.C., or any bookseller, as announced on page 828, Vol. I., of WORK.

Japanese Screen—to Imitate.—F. C. (*London, S.W.*).—To imitate a Japanese screen, the specially notable product of an artistic nation, is, I confess, to me a superfluity of naughtiness. For when the originals are to be bought for a few shillings, why produce a mockery of one? However, perhaps my business is to reply not to criticise. Now there are at least three broad divisions of these things: a lattice-work variety interspersed with fret-cut panels; a lacquered sort; and the ordinary folding screen with panels of painted paper or silk, or of embroidery. Probably your idea is to make a folding screen ornamented in Anglo-Japanese style. If so, you might take a groundwork of American cloth, say a bright red or dull blue, and paste on it genuine Japanese scraps—the crape pictures sold at the Oriental warehouses—but I doubt the result. Of course, if your idea of Japanese art is that it is anything one-sided and "quaint," you might choose the ordinary *olla podrida* of coloured prints and stick them just as unlike the European way as possible, and label the whole Japanese. Forgive my suspicions, people have done thus, and gloried in their artistic depravity. Or with a ground of crêpe lincrusta you might paint sprays of hawthorn and other graceful branches, and obtain a very fair equivalent to the genuine thing. Or you might take a plain self-coloured ground and cut out from some of the really beautiful wall papers and chintzes of the period, certain branches, flowers, and birds, and having varnished the whole obtain a pleasing *rococo* effect. But remembering that ten or twelve shillings purchase a real one, you would hardly save money, and you would certainly fail to obtain a thing better than the originals. If, notwithstanding my raillery, you will tell me more definitely your idea, I shall be pleased to do all in my power to assist you. Knowing personally, I think, almost every shop, retail and wholesale, where the products of the land of the Rising Sun are to be had, and with a valuable collection of many hundreds of Japanese books of pictures and patterns, I speak with knowledge, and shall be delighted to pass on any of it if it suits your ends.—E. B. S.

German Silver Wires.—C. D. R. (*London, S.E.*).

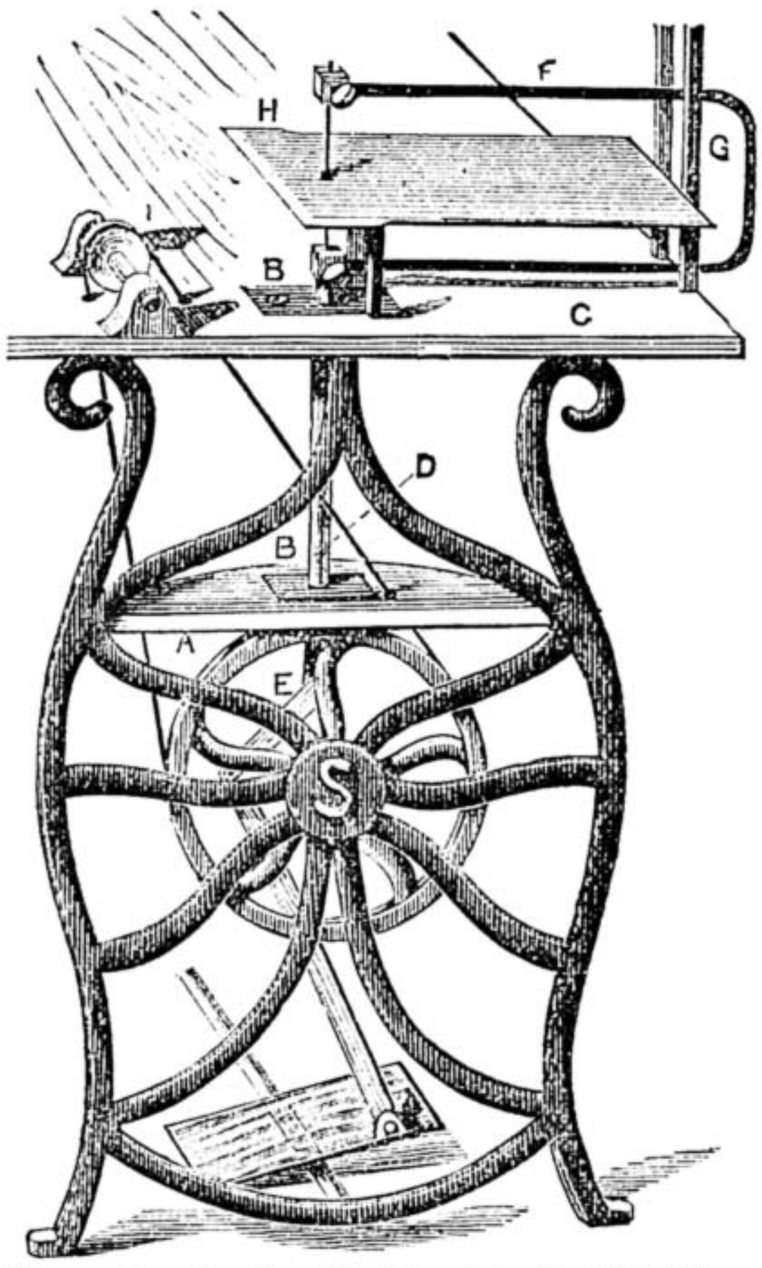
TABLE SHOWING APPROXIMATE RESISTANCE AND LENGTH PER LB. OF GERMAN SILVER WIRES.

B.W.G.	*Decimal parts of inch.*	*Lengths in yards per lb.*	*Resistance in Ohms per lb.*
No. 8	·165	4	0·0617
10	·135	6	0·1417
12	·109	9	0·3237
14	·083	16	0·9633
16	·065	26	2·562
18	·048	48	8·618
20	·036	87	27·23
22	·029	130	64·69
24	·025	195	117·1
26	·019	308	351·1
28	·016	440	698·3
30	·014	568	1191·
32	·012	782	2207·
34	·010	1177	4575·
36	·008	1777	11745·
38	·006	2550	24110·
40	·0058	3450	40125·

As German silver alloys vary considerably in their composition and hardness, no definite statement can be given of their length and resistance per lb. apart from actual measurement of each sample.—G. E. B.

Staining.—C. M. K. (*Chiswick*).—If you want to stain your table a very dark, or, as it is often considered, "antique" oak colour, you cannot do better than use the vandyke brown stain, which has several times been referred to in these columns. Should you prefer a lighter colour use a solution of bichromate of potash in water. By modifying this with vandyke brown you may get almost any shade of brown you require. By itself it gives the wood rather too much of an orange hue. Any good spirit varnish will do to finish with. You can easily make one if you wish to do so by thickening ordinary French polish with resin. All you have to do is to put some of each in a bottle. The spirit gradually dissolves the resin. As you live where varnish can easily be procured, I should, however, advise you to buy it ready made.—D. A.

How to Convert a Sewing Machine Stand into a Fret Machine.—AHNUS (*Sydenham*) says that he has a sewing machine the sawing part of which is past work, and that he would be glad to know how to convert it into an inexpensive fret machine; he also asks what the approximate cost would be. I would suggest that he should get a piece of mahogany 1 in. thick and wide enough to form a bracket, A, to project slightly over the wheel when placed horizontally against the standard and mark where it touches the standard; then cut it out so that it will come level with the outside and screw another piece of wood on to the right-hand side so as to keep it firm. He must now get two pieces of bar iron, B, 8 by 1 by ½; bore a ½ in. hole through the centre of each, screw one on the bracket, A, above the wheel, and the other on to the top of the table, C. A piece of ½ in. brass gas pipe, D, must then be passed through these bearings so that it will work easily and firmly. He must be particularly careful to see that the bottom of the pipe falls exactly over the centre of the wheel. Then connect the treadle with the pipe, D, saw a slot out of the



Converting Sewing Machine into Fret Machine.

bottom end, and bolt a piece of flat bar iron, E, in it; a hole must then be drilled in the bottom end of the iron to allow a screw to go through into the centre of the bolt that connects the treadle with the wheel—the top of the pipe must have a piece of hard wood driven into it. Now having got an ordinary iron fret-saw frame, F, he should knock off the handle; he will then find that it has a sharp point about 3 in. long; this point must be firmly fixed in the pipe, and care must be taken that the underside of the frame is square with it. This is most important, otherwise if it is not accurately done the machine will always have a slanting stroke. Some pieces of mahogany, G, must now be mortised into the top of the table, and the insides of these pieces ought to be faced with a strip of brass plate; if this is done the frame will be found to work easy. Two of these slides should be made, one at the front and one at the back; the one in front must be as high as the table, and that at the back should be a little higher than the frame when at its greatest height. The table, H, should be made out of a thin piece of mahogany and carried back as far as the slide, G. It will be seen that a small drill is figured in the illustration, I; this will be found to be well worth making. The drill is driven from the fly wheel by a round leather belt which comes up through the table a short distance in front of the frame. If the fly wheel is made heavier, which can be done by casting some lead inside it, the drill spindle can be lengthened, and a screw with a nut and collar on it can be fixed so as to hold emery wheel and circular saws; the last named will be found to be a very useful accessory for cutting straight edges in fretwood, but it is not advisable to do this unless a very heavy wheel is provided with the machine, or he can, as mentioned above, make it heavier. As to what it will cost it is rather hard to say, as it will depend on whether he intends to make all the parts himself, or whether he gets some made for him; but in either case he is recommended to have the bar iron for the bearings bored by a competent man, because the success of the machine depends entirely upon the accurate working of the pipe. On the whole the cost should not exceed a few shillings. Any further details will be supplied by W. R. S.

Easel.—AMATEUR PAINTER.—An article on the construction of an easel is in hand. No doubt it will appear as soon as the Editor can find space for it.—D. D.

Deal Staining.—H. T.—I must trouble you to repeat your question, and give more particulars of what you want than you do. As one kind of chestnut wood is perfectly white, you cannot "stain" any pine to resemble it. The other chestnut wood varies in colour, and so does deal. Without knowing more precisely the present colour of the latter and what you want to stain it to, it is impossible to give you the desired information. I am also unable to understand what you mean by "stopper." Kindly explain.—D. D.

Etching Tools.—T. L. T. (*Chester*).—Mr. Rhind, chemist, Gloucester Road, Regent's Park, London, N.W., supplies plates ready grounded and all materials. Roberson, artist's colourman, Long Acre, W.C., also supplies materials. Hughes & Kimber, Fetter Lane, London, E.C., make plates and supply tools.—F. M.

Gas Matters.—KNARF (*Manchester*).—(1) It depends on the kind and make of the engine how much gas it consumes, but, speaking generally, the average consumption of gas in a gas-engine of the Otto type per effective horse-power per hour, including igniting flames, is about thirty cubic feet. (2) By "igniting" a gas is meant setting it alight, and gas can hardly be said to expand when consumed. I presume you mean "heating" the gas, when it and all gases, including air, expand 1 $\frac{1}{491}$ of their volume for each degree of temperature above 0° Fahr. The simplest way to reckon this out is as follows:—if 1 c. ft. of gas at 0° F. increases to 1 $\frac{1}{491}$ c. ft. at 1° F., to 1 $\frac{2}{491}$ c. ft. at 2° F., to 1 $\frac{3}{491}$ c. ft. at 3° F., and so on; then conversely 1 c. ft. at 0° F. will decrease to (1—$\frac{1}{491}$) c. ft. at—1° F., to (1—$\frac{2}{491}$) c. ft. at —2° F., and so on, till at—491° F. the gas will theoretically occupy no space at all. This is called the "absolute zero," and it is by far the easier plan to reckon the volume of gas from it. By adding 491 to the temperature of the gas as it stands, and 491 to that to which you intend heating the gas, the question becomes a mere matter of proportion. Suppose the 1 c. ft. of gas is at the ordinary temperature (60° F.), and you wish to know to what it will expand if heated to 300° F., then

$$(491 + 60) : (491 + 300) :: 1 : x.$$

$$x = \frac{(491 + 300) \times 1}{(491 + 60)} = \frac{791}{551} = \text{nearly } 1\tfrac{1}{3} \text{ c. ft.}$$

In this you should be able to substitute your own figures. Of course this assumes that the gas is free to expand, but if enclosed the pressure it exerts will increase in direct proportion to the expansion the gas would otherwise undergo. For instance, if the 1 c. ft. of gas be in a vessel only holding 1 c. ft., it exerts only the ordinary atmospheric pressure of 15lbs. to the square inch; but if it be heated in that same vessel to a temperature at which it would, if free, occupy two cubic feet, the pressure it exerts will be doubled to 30lbs. to the square inch. (3) Petroleum, being inflammable, acts in the same way as gas by generating heat when consumed. The petroleum can be directly sucked in from the barrel by a pump connected with the engine, or be pumped into a reservoir above the engine; in the latter case the engine requires no attention, as it stops as soon as the supply of petroleum is consumed. From the reservoir the petroleum is conducted by a pipe to the above-mentioned pump, by which small quantities are injected into the cylinder of the engine. The oil is supplied at the rate of four drops per revolution, and, at a given point, is ignited by means of a small spirit lamp. The *modus operandi* is as follows:—On its outstroke the piston draws in a charge of air and petroleum, and on the return stroke it compresses the mixture, which is exploded as the crank passes the back centre. The combustion and expansion of the charge take place at the third stroke, the products of combustion being driven out at the fourth stroke. (4) Vaporisation of the petroleum, previous to use, does not take place, the engine using it in its fluid condition. (5) The consumption of petroleum is 1·32 lbs per horse-power per hour. (6) Gunpowder expands about 3,000 times its bulk on being ignited, and exerts a pressure of about 40 tons per square inch. (7) Yes; all models and drawings you may send for inspection and advice will be treated as strictly private and confidential.—F. B. C.

Maize Treatment.—MAIZE.—To obtain the starch from maize, soak the corn in water for about twenty-four hours, crush or grind it to a paste, put it in to a fine sieve, and wash well with water. The fine granules of starch are carried through the sieve by the water forming "starch-milk," and are deposited on standing at the bottom of the vessel used. The water washes out nitrogenous matters as well, but these do not settle so rapidly as the starch, and can be drawn off. By repeatedly stirring up the starch with fresh water, allowing it to settle, and drawing off the water, the starch can be obtained practically pure. The nitrogenous matters can be mixed with the husks, etc., and used for cattle food. A modification of this method is to steep the maize at a temperature of 77° to 140° (Fahr.) until a slight fermentation sets in; by this means some lactic acid is formed which disintegrates and partly dissolves the nitrogenous matters and thus facilitates the mechanical separation of the starch. Another method is to soak the

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grain in water containing caustic soda (200 grains of alkali to a gallon of water) for twenty-four hours, wash, grind to flour, and again soak it for two or three days in fresh alkaline solution. The alkali dissolves a good part of the gluten and can be drawn off from the deposited starch, which is then shaken with clean water, run off from the heavy woody fibre, and purified as already described. In each case care should be taken to keep out dust and insects, and plenty of clear and fresh water should be used. These methods can be used on any scale from grains to tons, although on a large scale machinery is necessary to save time and labour and prevent waste.—F. B. C.

Glue and Gelatine.—F. M. P. (*Muswell Hill*).—I am not aware that there is any method by which these can be made from horns. They are prepared from cuttings of skins and other gelatinous portions of animals, but the process is quite unsuitable for amateur work. In case there may be an easy method of preparing glue in the way you inquire about, I give your question, hoping that some reader may be able to enlighten us: "How can gelatine be obtained from (*a*) bullock's horns, (*b*) the cores of horns?"—L. P. L.

Cutting Bracket Pieces.—F. D. (*Liverpool*).—A joiner would probably mark out the bracket, full size, on any board of sufficient size he had handy. All that is necessary is a straightedge to the board, and a square, rule, and pencil, for the upright part of the bracket, lines drawn parallel to the edge, and for the horizontal part the lines can be drawn with the square; fixing upon the position of the stay, the length and the angles can be easily marked, and the bracket made strictly to the drawing. If this is thought troublesome, then the two pieces can be joined at right angles and the recesses cut, and the stay marked to them, or the stay cut to the shape desired, and used as a pattern to cut the recesses; but the plan of setting out the bracket on a board and working to the drawing is not only the best, but the quickest way, effectually avoiding "taking off a slice here and there and failing in the end."—B. A. B.

Adhesive Paste.—W. J. (*Ireland*).—The paste you used, composed of half glue and half paste, is the proper thing for sticking up lincrusta. The best way to make it is to make the paste as if it were for ordinary paperhanging, and the glue as if it were for woodwork, and then mix them together. The paste should be put on the lincrusta nearly boiling, in a warm room, but not too thick, taking care that all possible fitting, etc., has been done before pasting. It is most essential that the paste should be hot and the lincrusta as warm and pliable as it can be made. It is very likely the fact of the glue chilling, and the lincrusta being hard and stiff in places, which cause the bulges you complain of. Sometimes it is found advantageous to tear off the canvas back; but most of it is now made with paper backing—in fact, I think I may say all, unless otherwise ordered—it being found that the paper backing greatly facilitates the hanging. If, even after the above precautions have been taken, you notice any bulged places, they can be got rid of by slitting them with a sharp knife, and holding a very hot iron in front, and dabbing it back with a cloth dipped in hot water and wrung out. I have seen nearly every pattern made by the company hung from time to time, and the method adopted has always been as described. The only case of failure was when the plaster on the walls was not of sufficient strength to carry the weight, etc. Most paperhangers hold that it is absolutely necessary to line the walls with brown or white lining paper before hanging the lincrusta. I do not say it is not, but if your failure has taken place on a lined wall, try it without. For whatever lining paper will stick to with ordinary paste, lincrusta with paper backing with glue paste will stick to stronger, providing the room and consequently the wall is warm, also that the wall has been sized. Always warm the lincrusta before unrolling in cold weather.—E. D.

Non-Conducting Packing.—J. R. (*Keighley*).—I should think a wood packing with perforations bored through parallel to the face, and vertically if possible, with a layer of asbestos between it and the metal, should serve your purpose The wood might be held by sungs to the steam jacket and the bracket fixed to the wood by screws, but these details must depend upon the purpose for which the bracket is required; with more definite information I could better advise on the matter.—F. C.

Piano Materials.—JACK OF ALL TRADES (*Liverpool*).—I believe you could purchase the wrest plank and bent-side in your own town. Try Owen's, St. Anne Street, or Roberts', Camden Street. If you get the beech the size you require, with the flower of the wood on the flat side, it will suit your purpose. Perhaps a local pianoforte maker, such as W. H. Davies, Irvine Street, Edge Hill, or W. Latham, Soho Street, Islington, would oblige you by supplying you with materials. You will probably have to pay 2s. 6d. for wrest plank, and 1s. 6d. for bent-side.—T. E.

Piano Frame, Bronzing.—BRONZIST (*London, E.*).—To bronze cast iron frame of piano it will be necessary to first fill up the minute holes that are frequently found in cast iron. To do this, mix whiting with patent size and give the frames a few coats, allowing it to dry after each coat, and rubbing level with glass-paper until you get a smooth surface. Now give a coat of japanners' gold size, and when nearly dry, "but still tacky," take a piece of wadding, and dip well into some bronze powder, then dab it over the frame until it is covered. When all is dry, dissolve some parchment cuttings in warm water until it forms a size. If you give it a coating of this size, it will protect it. You may obtain the materials at any large colour merchants' at a reasonable price. There are several shops in Old Street, E.—T. E.

Small Steel Casting.—A. L. (*Ripon*).—Samuel Osborne & Co., Clyde Steel Works, Sheffield, will supply the casting you require.—J.

Ear Drums.—F. J. B. (*Reading*).—I regret I cannot open a correspondence as you request.—ED.

Squeaking Piano Keys.—JAY BEE (*Edinburgh*).—I cannot tell from your letter what kind of action is in your piano. If you could have given a sketch of one note, however rough, I might have answered your letter with more certainty. I presume it is what is known as a "sticker action;" if so, at the end of the key is an upright piece of wood with a spring in front; this is a hopper. If you raise the key off the centre pin, and take it out of the piano, you will find that the blacklead on the top of the hopper has been worn off and wants replenishing. Blacklead or French chalk is the lubricant used for wood; do not use oil or grease, as this swells the wood and makes the parts tight. Mix the blacklead into a thin paste and apply it, then polish with a piece of leather or steel.—T. E.

Piano Making.—W. H. M. (*Sussex*).—You ask is it possible to obtain answers to your questions; I may say it is possible to obtain an answer to any question which comes within the scope of WORK. If you read the third paper on "How to Make a Piano," you will find that the screws go through the wrest plank and bent-side from the front, the heads of the screws showing in the front. I may say here that the gluing is most important, for if the glue gave way, the screws would not hold it, but the screws prevent the glue starting. As to the bent-side, it is covered with an iron plate, as you will read also. The veneering is necessary, as it prevents the wrest plank splitting, as the wrest pins are so close together. But you would not find much difficulty in veneering it. It is much more simple than you would imagine. The veneered side of wrest plank is the front side. As the wrest pins do not pierce entirely through the plank, a veneer on the side which is glued to the bracings would be useless for the purpose of preventing the splitting of the plank.—T. E.

Printing and Lithography.—A. R. (*Brighton*).—In answer to your query as to these subjects having appeared in WORK, I have to say that papers are under consideration, but have not yet been decided upon. We shall always, however, in "Shop" be glad to help you in any difficulty that may crop up, if you will send us full details, sufficient in fact to enable us to see the true cause of any failures you may encounter, and if you enclose specimens of paper, ink, or other materials, it would materially help us to condense our reply. Above all do not ask us more than one question in one letter; if you have several queries write on separate paper for each. If you have no special printers' broker in Brighton, you might apply to some lithographer, who would oblige you with what you require; failing that, write to Messrs. Stoer Bros., Queen Victoria Street, E.C., or to Messrs. Hughes & Kimber, Limited, West Harding Street E.C., or B. Winston & Sons, Shoe Lane, E.C., who will send you price lists. Litho-stone is sold by weight at from 1½d. to 4d. per lb., according to size and quality. For chalk drawing, the stone requires to be grained after it is polished, and for this purpose "grey" or "blue" stones should be used, as this quality gives a sharper and cleaner tooth than the yellow qualities, and any "chalk-pits" are more readily seen. For circulars, plate transfers, etc., yellow stones are quite good enough, are cheaper at per lb., and weigh less in proportion. The etching solution should, however, be weaker than for the grey stones. Write us again if you do not succeed.—J. W. H.

Flat-Bottomed Punt.—F. H. (*Exeter*).—We think that the dimensions given, viz., 14 ft. from stem to stern, 13 ft. 4 in. (over all) length at bottom, width at gunwale amidships 3 ft. 8 in., width at bottom 3 ft., spring of floor, about 1 in. (we should advise 2½ in.), are pretty good proportions, but suggest that for single-handed work the length is too great, as it would entail using something very much thicker than ¼ in. stuff, which, when planed and finished off, would barely stand up to full ¼ in.—we should not much exceed 18 ft. 6 in. length over all. To arrive at the depth, first roughly calculate the cubical contents of the punt at say a unit of one foot in depth, and get at the approximate weight of the material plus the cargo (*i.e.*, yourself and traps). You will find plenty of tables of the weight per inch of various kinds of wood and iron rails, etc.; from these data you can readily arrive at the displacement of water which this weight acting on it produces—that is, what depth it will sink to in the water. You can then decide how much free board you would have above this water-line. Before you commence the actual building you should draw out a "sheer" plan as shipbuilders call it, full size, on a smooth floor rubbed over with chalk, exactly to your dimensions, and draw in *full*, and also in *section* every rib, knee, and timber in her, which will give you exactly the flare or curvature to which her side planks must be cut. If you could manage to watch a barge-builder at work, details too numerous to mention, and how they are carried out, would be apparent to you. Meanwhile make your full-size drawings, and if you are uncertain, send us small scale drawing of the part in which the difficulty occurs and it shall be corrected and engraved in "Shop," and our advice given you. We have in preparation an article and drawings of a similar very light and portable boat, though hardly a punt, which may find its way into WORK later on. We hope to hear from you again if we can be of any assistance to you.—J. W. H.

Indiarubber Stamp Making.—A. D. X. (*Leeds*).—The proportion of rubber and sulphur varies with the purpose to which the compound, when vulcanised, is to be applied, and is, to some extent, a trade secret. Properly prepared rubber compound (unvulcanised) can readily be obtained commercially, and it is far better for an amateur to purchase it ready for use than to attempt its preparation—a process quite beyond the reach of ordinary appliances.—QUI VIVE.

Battery for Telephone.—C. W. J. (*Clapham Common*).—The action of a telephone made as described in WORK would not be improved by the use of a battery unless a microphone was included in the circuit. See former replies to similar queries, and read the article over again.—W. D.

Opalestic Topas.—L. J. P. (*Wellingborough*).—In jewellery that we get at the West End of London there is no stone, as far as I know, with a name like that. I, therefore, feel disposed to reply almost positively that it belongs to the same class as sapphirines, that is, it is a production of the chemist's, not of Nature's. I should say that it is, in all probability, not even an imitation of a real stone, but some coloured glass that looks nice when cut to represent stones. There is a rough-and-ready way of judging if stones are genuine, and that is, are they mounted in good settings? for if a manufacturer goes to any expense, the chances are that the stone is a real one. If the price of the article is a matter of shillings only, then my verdict will be that the stones are not real. You will understand that I cannot give a clear decision without seeing the stone, for the name alone is not to be depended on. Things do get called by any name but the right ones. And besides that, you have not sent any description of its appearance.—H. S. G.

Ornamenting a Fireplace.—PLEASURE AND PROFIT (*London, W.*).—Your query requires an illustrated article to do the subject justice, and your pseudonym foreshadows what a reader might hope to gain from its perusal; so in place of saying that the best ornament to a plain fireplace is a pretty wife, or recommending you to buy so many yards of art fabric at ¾d. a yard, to bandage it with, I have cast the reply in the form of an article, for which the Editor in due season will, no doubt, find place. One item, for instance, you do not say, *i.e.*, whether it be your own freehold, or merely in tenancy. Yet this is most important, for while I could advise you to paint or otherwise ill-treat your own property, if it were a landlord's, future compensation upon quitting the house might lead you to regret having meddled with it.—E. B. S.

Pattern Tracing.—MANIFOLD.—Your letter was unfortunately mislaid by the churl whose duty it is to answer the Editor by return, and he humbly apologises. For tracing there is a special transfer paper sold at most fancy-work shops. One alternative is to prick the design on fairly thick paper and rub French chalk through the holes. This is sufficient for bold, easy patterns, but for small scale or elaborate work, the transfer paper, sold in various colours, is the only adequate thing.—E. B. S.

Wood Turners.—T. H. (*Radcliffe*).—You inquire for a London firm of wood turners. I can recommend Messrs. M. C. Duffy & Co., 66, Storks Road, E.C., for inexpensive and good work; Messrs. J. Eberhard & Co., Edward St., Hampstead Road, N.W., are also, I believe, entirely capable and satisfactory.—E. B. S.

Galvanising.—BLACKSMITH (*Dukinfield*).—Iron is galvanised by first pickling in muriatic acid, diluted, and then plunging it into a bath of molten zinc (which, to save waste, should be covered with a layer of sal ammoniac) until it is the same temperature as the bath, when it is lifted out and drained. If there are galvanising works near you, it will probably, for such small quantities, be cheaper to get them done than do them yourself.—F. C.

Bookbinding Tools.—T. E. T. (*Brixton*).—I am exceedingly sorry that I cannot help this querist in any way. I can answer his questions, but the answers must be in the negative, hence my expression of sorrow. Bookbinders' finishing tools are dear; it is impossible to get over that; they are seldom to be had second-hand; I have seen them for sale in Edinburgh, but not anywhere else, not even in London. The leaden type used by printers would be useless in the hands of an amateur, and as this is made in founts, *i.e.*, a certain number of alphabets to the fount, it would be almost as difficult to get a few letters, for type founders would hardly break a fount by selling a few. I could give you a list of addresses of bookbinders' tool cutters, but that would not help you much, as the prices of the various firms are pretty much alike; however, you might try Messrs. Nix & Gray, 108, Fleet Street, London, E.C.—G. C.

Artificial Leg.—J. G. T. (*Dowlais*).—We cannot give sketches of artificial limbs, nor deal with surgical or medical questions. Upon an artificial leg matter you had better apply to Mr. James Gillingham, surgeon machinist, Chard, Somerset.

Steam Launch.—Will B. F. (*Birkenhead*), who sent, some weeks ago, a small MS. on the above

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subject for "Shop," kindly send his full name and address to the Editor of WORK?

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

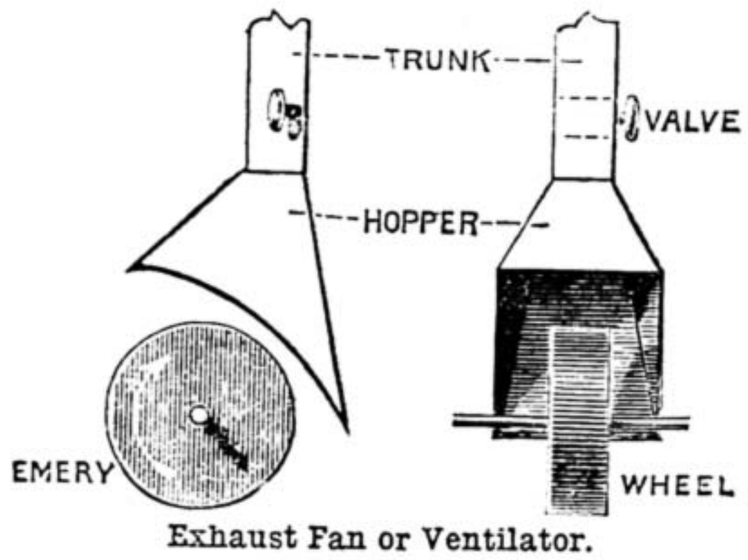
Rubbing down Oilstones.—W. M. (*Birmingham*) writes in reply to E. P. (see p. 619, Vol. I.):—"I made inquiry, but the glass was unknown here in Birmingham; it was suggested was it 'P. R. P.?' I took a piece about 18 in. square, costing a shilling, to try it. It is the thick roofing plate roughed on one side (not 'fluted'), and it is cheap. No directions were given by A. G., but I cleaned the oilstone and used it dry. It answered admirably, nothing could be better. In half an hour an oil-stone badly hollow was made flat and true. Of course I rubbed every way all over the glass to keep that flat. I should say the glass would do any number in moderation; it is far better than emery or 'grindstone.'"

Colouring Ceiling.—MEUX QUE CA writes in reply to BOATHOOK (see page 30, Vol. II.):—"I will help you over the stile. Wash off that ceiling, and as you go scrape out all cracks, wet well, and stop with either Keen's or Peran's; and if any of the cracks have dropped on one side, flush them with some thin stuff with your broad knife or stripping knife. Buck's is the best for this job. Remember, all your stopping must be used neat, neither size nor whiting being added to cool it. Make up a little at a time. Now get a pail of well-washed whiting, and ask them to let you have the lump instead of the loose. Now get 1½ lbs. of Cannon's best concentrated size; remember, none of your rubbish. See that the signature is there in full; it will cost you 1s. 6d. Now twopenny worth of best Venetian red; if you use any other you will be sure to leave blemishes somehow or other. Now get a tin and put your Venetian red in it, with enough water to cover it; put it on one side to soak. Now get two clean pails and a stirring stick. Break open the size packets and tip them into one of the pails. Put about three pints of water to it, and stir up well with stick: stand that on one side. Now put on a kettle of water to boil. Now tuck up your sleeves, and don't be frightened. Half fill your other empty pail with water, and get a small hammer, and hold each lump of whiting over the pail with water and tap it gently so that it falls floury. Keep on at this until the broken whiting mounts well above the water. Now see if the kettle boils. If so, pour it in on top of size, stirring it well as you do so. Now stand that away to cool, for you must not make use of it in this hot state, as you may have another Red Sea. Nor must you let it chill or jelly as you would call it. Now in with your hand into your pail of whiting and break it up thoroughly. Your whiting ought to be as round as thin glazing putty, so that you find it very hard to stir your hand in it; if it is not so, make it so. Put a little of it on a piece of paper just to check your eyes when tinting. Now put in a little of your Venetian red, which ought to be well soaked. You can give it a rub up if you have any doubts of it. And remember, let no size go near any of the stuff until you have got your required tint, or there is sure to be a Red Sea. Keep adding little bits of your Venetion red to your pail of distemper until you think you have got it, comparing it with that little bit of white you took out. Then dry a little on a piece of paper in front of the fire, keeping the distemper side away from the fire and clean side of paper to it. Now first stick a pin in it, and place it on your ceiling. Don't look at it just then, go out and have a look at anything green (the grass) for a minute or two. Come back and look suddenly at it, and decide yes or no. When you have got it to the tint, add your size, which ought to be nice and cool by this time, and stir round with your hand. You will find it become so very stiff for a minute or two that you will hardly be able to stir it, but add more size to it until it becomes like good round oil paint in appearance. Now strain it carefully into another clean pail. Put about a quarter of it back into the first pail, and add the rest of your size to it, which ought to make it very thin and strong. I mean for you to put the rest of the size to the quarter you have poured back! Now into this also add about a table-spoonful of ground alum; stir well, and this is now what is termed in the trade 'clear coll,' or preparation. Put one cupful of cold water gently on top of your pail of distemper, so as to prevent a skin from coming on as it chills. Cover it up, and put it away in the cool to chill, which will be next day most likely. Now, if your ceiling be dry, you can go over it nicely with the 'clear coll,' so that it will be dry for next morning to distemper. Get your mate to help you, and do not attempt it by yourself. Begin at the light, and work from it—centre ornament first, bed of ceiling next, and cornice last. Do your bed in two feet strips, and, when you make a shift, go along the edge of the strip of distemper you have put on and soften it well into it. Throw open your windows when finished if the day be fine; if wet, no. It would take a book to tell all even in a trifling job as this is, for there is not a tithe of the knowledge given here that ought to be given. However, let us know how it goes off, please."

Leather Laces.—W. W. (*Northampton*) writes in answer to G. L. (*Gainsboro'*) (see page 44, Vol. II.), that Messrs. Mobbs & Co., Cow Lane, Northampton, sell a machine for cutting laces. It will cut a lace, I think, about three feet long, and its cost is about 30s.

Book on Sheet Metal Work.—J. J. M. (*Woolwich*) (see page 782, Vol. I.) writes in reply to L. P. (*Deal*):—"I have to inform L. P. (*Deal*) that all the remaining copies of Warne's book on metal plate work were sold by subscription to the members of the Amalgamated Society of Tinplate Workers for the benefit of his widow. The published price of the book was 10s. 6d.".

Exhaust Fan or Ventilator.—H. B. P. (*Hendon*) writes in reply to D. B. S. (*Ferns*) (see page 750, Vol. I.):—"You give such very meagre details about the number and position of grindstones and emery wheels that your question cannot be answered very satisfactorily. The dust from the grindstones, I think you will find, is much too heavy to be drawn off by an exhaust fan, as it is wet with water. The dust from the emery wheels, being dry, can be more easily managed, provided the hopper (shown in sketch) can be got near the wheel. This will be found difficult, as it will, if too near, interfere with the work. Above each wheel, and in about the proportion shown in sketch, place a wooden hopper, and from the top of this carry upwards a rectangular wooden trunk, fitted with valve as shown, to shut when wheel is not in use, so that the suction may be stronger in the wheels at



Exhaust Fan or Ventilator.

work. These trunks must be connected to one running longitudinally under the floor of the loft, and in such a position from the wall that the greatest number of hoppers can be connected with it without any superfluous bends, as these materially interfere with the draught. Midway in this longitudinal trunk a connection must be made to the exhaust fan. This connection should be of the same sectional area, or slightly larger, than the combined areas of exhaust passages in fan. The longitudinal trunk under loft, from its connection with the fan, should decrease in section in both directions, after each connecting trunk to emery wheel is passed, till at the ends it may be of the same sectional area as the upright trunk connecting the hopper to it. The size of the fan must be determined by the amount of work to be done, and cannot be settled satisfactorily till more particulars are given. The loft, if vacant, is a good place to put it, as it could be easily driven by means of a counter-shaft from the line shaft, which I assume is below the flooring."

Deposit in Pipes.—H. B. S. (*Liverpool*) writes in reply to ADALIA (*Asia Minor*) (see page 30, Vol. II.):—"ADALIA inquires whether there is any method by which he can get rid of a deposit in the water pipes. I am very pleased to hear from this out-of-the-way locality, and will give what information I can. Judging from the description your correspondent gave, I should say that the deposit is carbonate of lime which, originally in solution in the water, has deposited. Now, if your correspondent can get an acid—hydrochloric would be the best, diluted with water—and can manage to disconnect the pipes in some way so as to allow some of the acid to pass through the pipes, he will effectually clean the pipes if they are of lead or of earthenware and the deposit is of carbonate of lime; run a quantity of water through to clean afterwards. If he can get at the source of supply, then a definite quantity of lime, or of carbonate of soda, may be added to it before it enters the pipes. The quantity required can only be got at by an analysis of the water. If your correspondent wishes to do anything effectually, I will help him if I can. Let him send over some of the substances filling the pipes, and I will analyse it for him. That is the way to get at the remedy. Also let him give us particulars of the method of water supply and kind of pipes."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—FOREMAN BRICKLAYER; W. G. C. (*Rochester*); BAR FRAME; P. V. S. (*West Hackney*); TRYING (*Oswestry*); J. G. (*Stockport*); T. T. (*Sheffield*); ASMODEUS; H. G. (*Dewsbury*); J. V. C. R. (*Pendleton*); S. W. R. S.; L. F. (*Shaftesbury*); T. B. (*Manchester*); H. S. G. (*Battersea*); F. W. B. (*Golcar*); H. B. (*Jarrow*); F. S. C. (*Durham*); A. W. A. (*Waltham Cross*); C. H. W. (*Hampstead*); DITTONIAN; W. B. (*Highgate*); C. W. B. (*Plymouth*); IGNORAMUS; G. B. (*Liverpool*); H. G. L.; W. R. L. (*Glasgow*); A. H. H. (*Birmingham*); A. F. W. (*Oldham*); S. D. (*Heeley*); J. E. H. & Co. (*Birmingham*); J. G. W. (*Birkenhead*); H. M. (*Leeds*); FELLOWS (*Kent*); H. K. (*Stamford Hill*); A. W. P. (*Leytonstone*); E. R. D. (*Sherborne*); F. S.; G. R. D. (*Shipley*); TINY TIN (*Sheffield*); GLASS; CHOPSTICKS; J. M. (*Suffolk*); YOUNG WHEELER; R. L. (*Edinburgh*); TOY MAKER; E. N. (*Herne Hill*); CURIOUS (*Belfast*); C. W. B. (*Plymouth*); LEWIS (*Forest Gate*); DUNCOMBE (*London, E.C.*); C. A. (*Hackney, E.*); D. McD. (*Inverness*); C. E. S. (*Stoke Newington*); H. C. (*Suffolk*); S. G. V. (*Battersea*); TINKER; P. T. (*Kazan, Russia*); F. McC. (*Birmingham*); R. H. W. (*Lewisham*); PAINTER; A. N. (*London, E.C.*); S. J. A. (*London, N.*); BOAT; R. J. (*Edinburgh*); WOOD CARVER; F. L. (*Islington*); W. B. (*Newcastle-on-Tyne*); W. T. (*Highbury*); A CONSTANT READER; C. B. (*Durham*); L. N. (*Carlisle*); WOOD WORKER; R. T. (*Norwich*); S. V. (*Devon*); A. O. N. (*London, W.*); D. G. (*Hereford*); E. H. (*Camden Town*); A READER OF "WORK".

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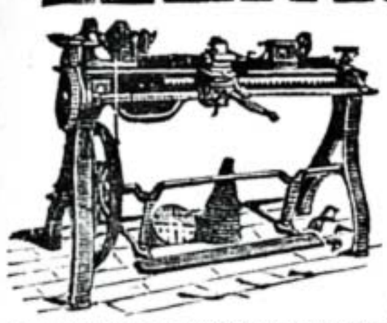

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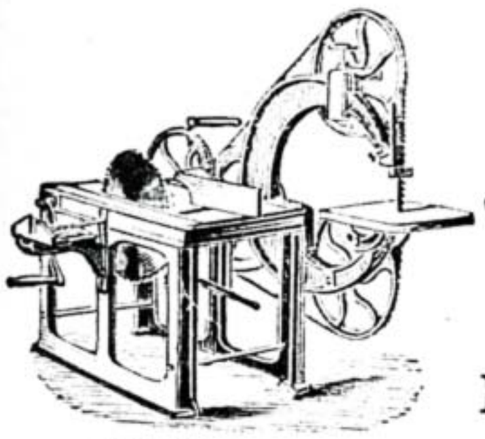

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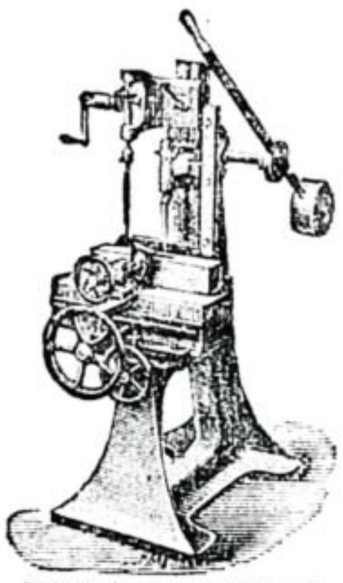

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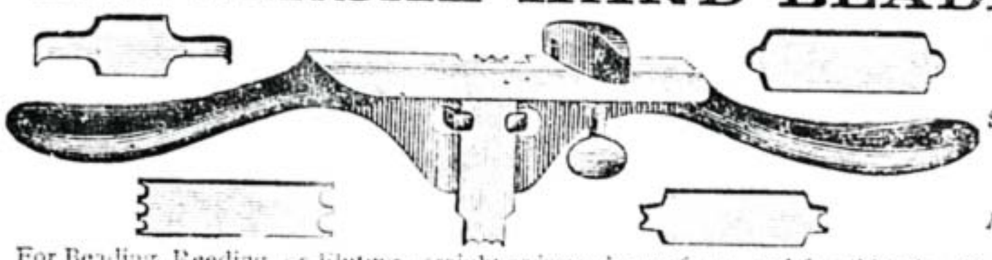

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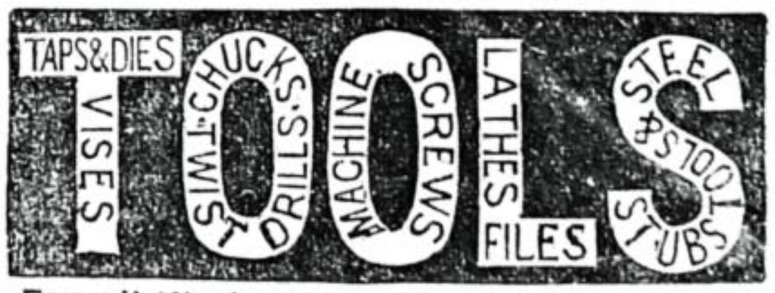

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